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LUME 36, No. 18

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American Dyestuff Reporter, Vol. 29, No. 18, September 2, 1940. Published every other Monday. Copyright, 1940, by Howes Publishing Co., 440 4th Ave., New York, N. Y. Domestic subscription, $5.00; Canadian, $6.00; Foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

AMERICAN DYESTUFF REPORTER

A. P. HOWES
Publisher

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Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

SEPTEMBER 2, 1940

VOLUME 29 NUMBER 18

American Dyestuff Reporter, Vol. 29, No. 18, Sept. 2, 1940. Published every other Monday. Copyright, 1940, by Howes Publishing Co., 440 4th Ave., New York, N. Y. Domestic subscription, $5.00, Canadian, $6.00, Foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

Contents

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

• Special Articles

Pectic Substance of Cotton Fibers in Relation to Growth.. 435
Roy L. Whistler, Albert R. Martin and Carl M. Conrad

Qualitative Identification and Quantitative Estimation of Nylon in the Presence of Silk, Wool and Cotton..... 437
R. Gerber and K. Lathrop

Thirty-Three Years' Experience in Raw Stock and Package Dyeing 454
Andrew Fisher

• Departments

Technical Notes from Foreign Sources..... 455

Trade Notes—New Products..... 457

Open Forum 460

• Editorial

Research and Prosperity..... 453

• Proceedings of the American Association of Textile Chemists and Colorists

Calendar of Coming Events..... P441

Report of the Nominating Committee..... P441

Outing, South Central Section..... P442

Unemployment Register P443

Bibliography on Flameproofing of Textiles..... P445
Emily Williams Akin, Lilly H. Spencer and A. R. Macormac

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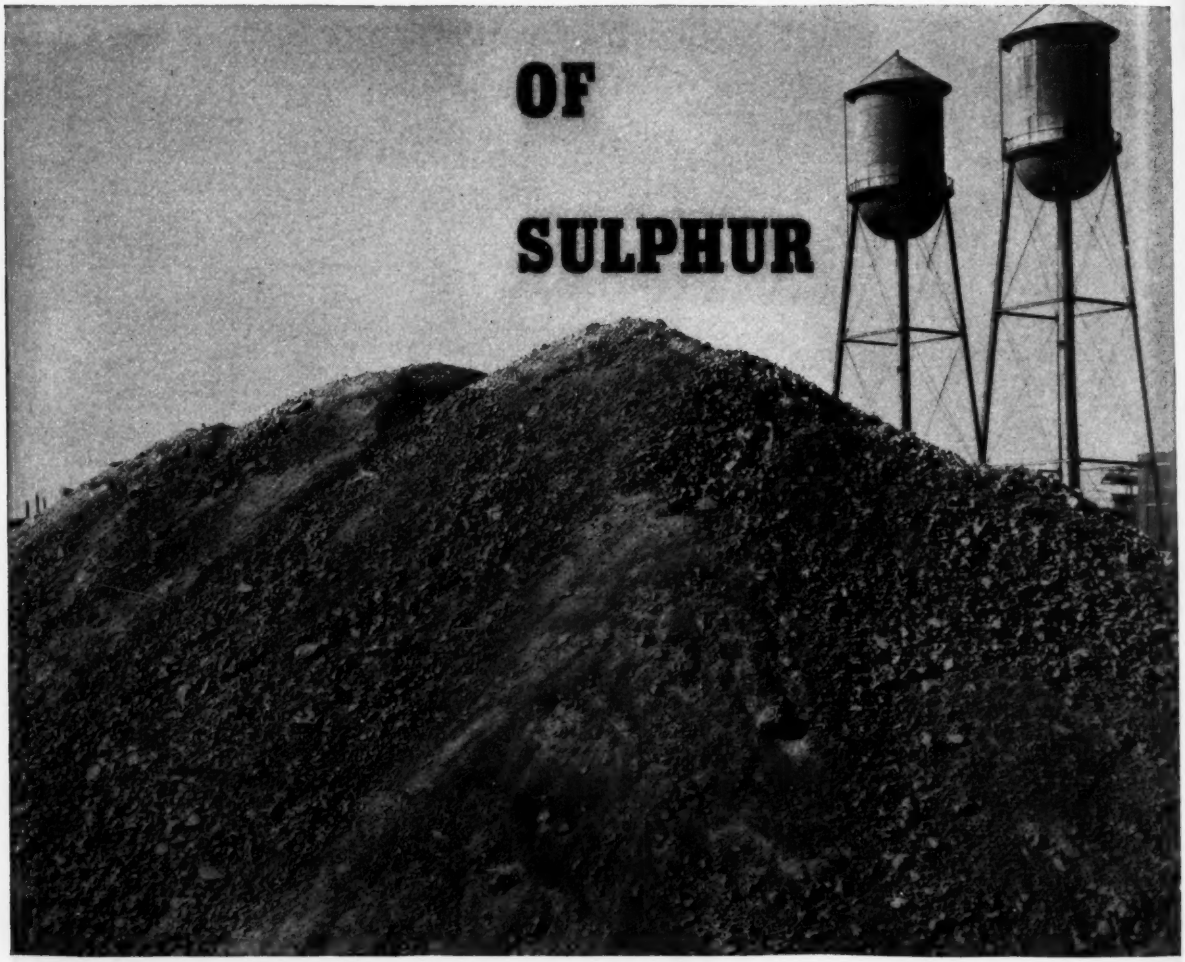

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VOLUME 29 SEPTEMBER 2, 1940 NUMBER 18

Pectic Substance of Cotton Fibers in Relation to Growth

ROY L. WHISTLER*, ALBERT R. MARTIN*, and CARL M. CONRAD**

I. INTRODUCTION

It has been suggested[1] that the pectic substance of cotton fibers is largely confined to the primary cell wall. Thus it would be expected that very young cotton fibers would contain a high percentage of pectic substance and that the percentage would decrease as fiber development progresses and would reach its lowest value at the time of fiber maturity. It was the purpose of the present investigation to examine this concept quantitatively by following the changes in percentage of pectic substance during the course of the development of cotton fibers.

Editorial Abstract

The content of pectic substance in cotton fibers at various stages of growth was determined. The results suggest three distinct stages of development of the fiber. The first extends to about the 18th day and is characterized by a gradual decrease in the content of pectic substance. The second extends from the 18th to about the 35th day during which time there occurs a rapid decrease in the content of pectic substance. In the final stage, which extends from about the 35th day to maturity, there is only a slight decrease in the content of pectic substance. These three stages of development are in good agreement with those deduced by other investigators from different types of data.

II. MATERIALS AND METHODS

The cotton fibers used in these experiments were collected during the summers of 1937 and 1939, from plants growing in the Experiment Station fields of the U. S. Department of Agriculture at Raleigh, North Carolina. The cotton was of the Mexican Big Boll variety of *Gossypium hirsutum*. The age of the fiber as collected in the field was determined by tagging the flowers on the day of blooming and then collecting the bolls at definite intervals. As soon as the bolls were picked, they were opened and the cotton fibers removed. The fibers which were to be used for the determination of uronic acids were quickly dried in a stream of warm air. Those used for the determination of pectic substance by the calcium pectate method were not dried but were quickly removed from the bolls at the time of picking and preserved in 80 per cent ethanol.

Uronic acid determinations were made according to the procedure developed by Whistler, Martin and Harris[2], and the results expressed as percentage of uronic acid-carbon dioxide on the basis of dry weight of the fibers or as percentage of pectic substance. Conversion of uronic acid-carbon dioxide to pectic substance was accomplished by multiplying the percentage of carbon dioxide by the factor 4.8[2]. The size of the samples taken for analysis varied from 2 to 10 g., depending upon the uronic acid content.

In addition to the determination of pectic substance by uronic acid analysis applied directly to the fibers, the 1937 series of fibers were analyzed for pectic substance by means of the calcium pectate method according to the following procedure: The sample (preserved in ethanol) was extracted 4 hours with 90 per cent ethanol in a Soxhlet apparatus. The fibers, after drying in a vacuum oven at 60° C., were subjected to a 30-minute extraction with 100 ml. of a boiling 0.5-per cent solution of ammonium citrate, followed by three successive 30-minute extractions with fresh 100-ml. portions of boiling 0.01 *N* hydrochloric acid. The entire cycle of 4 extractions was then repeated and the filtrates and washings were combined.†

The combined extracts were cooled, neutralized with sodium hydroxide solution, and the pectic substance was determined in an aliquot according to the procedure of Carre and Haynes[5]. The final calcium pectate precipitate was corrected for impurities by the method of Appleman and Conrad[6].

III. EXPERIMENTAL RESULTS AND DISCUSSION

The pectic substance content in cotton fibers at various stages of growth is shown in Table 1 and Figure 1.

*Research Associates at the National Bureau of Standards representing the Textile Foundation.

**Senior Cotton Technologist, Agricultural Marketing Service, United States Department of Agriculture.

†The frequent changes of solvent and the low concentration of hydrochloric acid were employed[3, 4] to minimize destruction of the pectic substance.

TABLE 1

Calcium Pectate and Pectic Substance Content of Cotton Fibers at Various Stages of Growth

Age of Fiber Days	1937 Series Calcium Pectate	1937 Series Uronic Acid-Carbon Dioxide	1937 Series Pectic Substance Content (Calc.)	1939 Series Uronic Acid-Carbon Dioxide	1939 Series Pectic Substance Content (Calc.)
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
10	4.39	1.24	5.95	...	...
11	4.02	...	...	...	...
12	4.05	...	...	...	...
14	3.95	...	...	...	...
16	3.24	...	...	...	...
17	3.24	1.16	5.57	...	...
18	3.21	1.13	5.43	...	...
19	3.58	1.01	4.85	...	...
20	3.44	...	...	...	...
21	3.12	...	...	...	...
22	...	...	...	1.04	4.99
23	2.39	.73	3.50	...	...
24	...	...	...	.79	3.79
25	1.85	.68	3.22	.60	2.88
26	...	...	...	.47	2.26
28	...	...	...	...	...
30	1.29	.39	1.87	.35	1.68
32	...	...	...	.31	1.49
34	...	...	...	.24	1.15
35	.83	.30	1.44	...	...
36	...	...	...	.23	1.10
39	...	...	...	.24	1.11
40	.62	.19	.91	...	...
42	...	...	...	.18	.86
45	.79	.20	.96	.21	1.00
48	...	...	...	...	...
50	.67	.22	1.06	...	...
51	...	...	...	.22	1.05
54	...	...	...	.21	1.00
OB	...	0.17	0.82	.19	.91

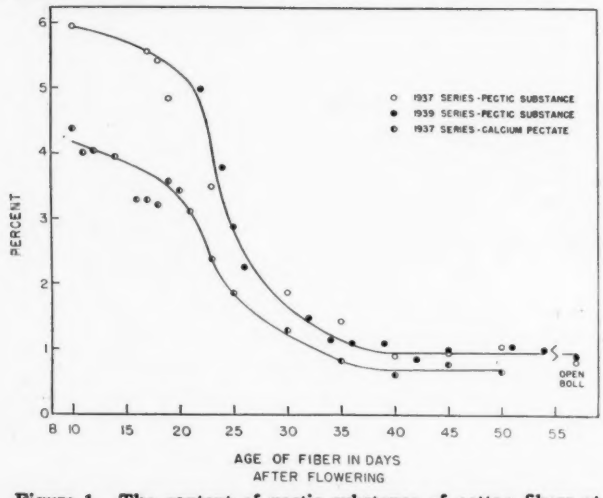

Figure 1. The content of pectic substance of cotton fibers at various stages of growth. The upper curve was obtained from uronic acid analysis; the lower curve by isolation of the pectic substance as its calcium salt.

It is seen that the percentage of pectic substance as determined by the calcium pectate method is consistently lower than that found by the direct method of uronic acid analysis. However, since methods of isolation in general give somewhat low results this difference is not unexpected.

An examination of the curves in Figure 1 reveals that they are composed of three major segments; the first extending to about the 18th day indicates a gradual decrease in the percentage of pectic substance with age of the fiber; the second extending from about the 18th to the 35th day indicates a rapid decline in the percentage of pectic substance; the third extending from about the 35th day to the time of maturity, indicates only a slight decrease in the percentage of pectic substance with age of the fiber. It seems probable that each of these periods may be related to particular phases of growth in the development of the cotton fiber. For example, if it is assumed that the pectic substance is largely confined to the primary cell wall, no large change in the percentage of the pectic substance should occur during the period of primary wall formation. However, as non-pectic material, for example cellulose, is deposited in the fiber, the percentage of pectic substance should decrease in approximate inverse proportion with the amount of deposited non-pectic substance.

It has long been recognized that the first phase in the growth of the cotton fiber consists in the development and elongation of the primary cell wall. The time required for the completion of this phase as measured by Anderson and Kerr[1] for cotton fibers of the Mexican Big Boll variety, is about 20 days. This is very near the age at which the curves in Figure 1 undergo a sudden and rapid decline. Thus the present data suggest that no major changes in the composition of the fiber occur during this phase of development.

With the completion of the development of the primary cell wall, the formation of the secondary wall is initiated and a rapid deposition of cellulose commences. This should result in lowering the percentage of pectic substance in the fiber, especially if no appreciable amounts of pectic substance are laid down with the cellulose. The second segment of the curve confirms such an interpretation and further indicates the rate at which the development of the secondary wall proceeds. This interpretation is also in accord with the work of Berkley[7], in which it was shown that in cotton fibers similar to those used in this work, the secondary cell wall underwent a rapid thickening between the 18th and 35th days of growth. An examination of the change in the percentage of cellulose with the age of the fiber further substantiates these views.*

From about the 35th day until the boll opened, the content of pectic substance underwent little change, as indicated by the third segment of the curve. This is in agreement with the findings of Berkley[7], who also showed that no significant change in the ratio of thin- to thick-walled fibers occurred during this period; a fact which indicates that no appreciable change in wall thickness is occurring.

*This report is in preparation for publication.

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Qualitative Identification and Quantitative Estimation of Nylon in the Presence of Silk, Wool and Cotton*

R. GERBER and K. LATHROP

NYLON, the new textile fiber announced by Du Pont in the fall of 1938, can be defined as a synthetic fiber having a protein-like structure built up by the polymerization of amides.

It has extraordinary tensile strength, elastic recovery from elongation, and insensitivity to moisture, which is said to make it a superior textile fiber. It imparts increased strength to yarns and fabrics composed of nylon in mixture with other fibers. Since the cost of nylon will apparently be relatively high because of the expensive processing necessary to its production, it may be expected that much use will be made of it in mixtures to give added strength. For this reason it is important to have available methods for the qualitative identification and quantitative estimation of nylon in admixture with other fibers. This problem was undertaken for the purpose of discovering, if possible, workable procedures for such identification and estimation.

QUALITATIVE TESTS

Four-meter lengths of nylon were scoured for fifteen minutes in 0.5 per cent olive-oil soap solution, rinsed in warm distilled water until apparently free from soap, and air-dried.

The following qualitative tests were made with the idea of discovering some peculiarity in behavior which would enable the qualitative identification and the separation on a quantitative basis of nylon from the other common textile fibers.

Ignition Test. When placed on a platinum foil and held in a non-luminous flame the yarns show a sharp melting point, and will not burn until after the fibers have melted. The ash left when the yarn is held directly in the flame is an extremely hard round globule, pale yellowish in color if the yarn is held in a non-luminous flame, but a darker brown to black color if held in a luminous flame (such as that of a match). The ash resembles that of cellulose acetate, but is very much harder, being extremely difficult to crush.

The odor of the burning nylon fiber is *very faintly* like that of burning wool, but more suggestive of the odor from cooking celery or green beans. It is, therefore, quite distinctive and hence of value in identifying the fiber when not in mixture with other fibers.

COLOR TESTS: *Millon's test.* Nylon does not give the characteristic brick red color with Millon's reagent. Instead the fibers take on a faint yellowish tinge as the solution is boiled.

Xanthoproteic test. With nitric acid the yellow color of xanthoproteic acid is not produced; instead, the yarns are completely disintegrated, producing a clear solution with the acid.

Diphenylamine in H_2SO_4 solution. There is no color change when nylon yarns are tested.

Iodine solution. Nylon is stained a very dark brown, almost black, color which is not removed by prolonged washing.

Neocarmine. With this dye nylon gives a pure green color most like that given by wool, which, however, is a yellowish-green.

SOLUBILITY TESTS: *Glacial acetic acid.* Nylon is very readily soluble in hot glacial acetic acid. On cooling the solution sets to a thick, white, jell-like mass, which in thin layers dries to a tough, white, Cellophane-like film. In cold glacial acetic acid nylon does not dissolve even after standing for two weeks.

Acetone. Nylon is not soluble in the hot or cold reagent.

Lead acetate solution (conc.) There is no apparent disintegration of the fibers in a boiling solution at constant volume for five hours.

Calcium thiocyanate (sp. gr., 1.36 at 70° C.). Nylon fibers are apparently not soluble.

Loew's Reagent. (Copper-glycerol solution). Nylon is not soluble and there is no visible change in the fiber.

Basic zinc chloride. In boiling solution the yarns are soluble, but leave a white opalescent film along the walls of the test tube which will not dissolve even when subjected to prolonged boiling.

Ammoniacal nickelic hydroxide solution. There is no apparent deterioriation of the fibers.

Schweitzer's reagent. Nylon is not soluble. After standing in the solution for seven days there is still no sign of solubility.

*Contribution from the Chemical Laboratory of Oklahoma Agricultural and Mechanical College in 1939.

Aluminum chloride solution. This reagent seemingly had no effect on the fibers, either when cold or boiling.

Sulfuric acid. (conc.) Fibers are soluble in the cold reagent without difficulty.

Hydrochloric acid. (conc.) Nylon is very insoluble with no apparent weakening of the fiber in the boiling, as well as the cold, solution.

QUANTITATIVE ANALYSIS

I. Preparation of yarns for analytical work

The yarns used were 2/40's mercerized cotton, 2/20's wool, 86 denier bright nylon and pure-dye crochet silk.

Approximately 0.5 gram skeins of yarns were used for quantitative work. Samples of mixed fibers were prepared by braiding together two 0.5 gram skeins (one 0.5 gram skein of each fiber) to make an approximately one gram sample. Four stands of each kind of fiber were used for braiding in order to make a broader braid and to give a more intimate mixture of the yarns, which would be more nearly like a woven fabric.

The yarns were prepared for analysis by the preliminary treatment used by Mease and Jessup.[4]

The apparatus used for extraction was a slight modification of the Wasitzky micro-extractor. (Morton* gives a diagram and discussion of this apparatus.). This equipment is claimed† to be as accurate for samples of 1-2 grams as the larger Soxhlet type extractor is for samples of 25 grams.

II. Analysis of Mixed Fibers

As nearly as practical, the method of analysis was desired to fit into and follow the already existing and accepted methods of analysis for union fabrics. The following scheme was pursued in the analysis of a fabric containing the common textile fiber, silk, wool, and cotton in addition to nylon.

a. Removal of silk by the calcium thiocyanate method. ($Ca(SCN)_2$ of sp. gr. 1.20-1.21 at 70° C.).

b. Removal of wool with boiling 5 per cent potassium hydroxide solution.

c. Analysis of the residue of nylon and cotton by removing nylon with acetic acid and weighing the residue as cotton.

For the silk-nylon analysis. (Data given in Tables I and II.) The method as used by Mease and Jessup[4] was tried on one sample of the silk-nylon mixture. Silk was found to be completely dissolved out in much less than the length of treatment (sixty minutes) specified by them.

The method given in A.S.T.M.[1] was tried and found to give more satisfactory results; however, the silk was completely dissolved out in less than the fifteen minutes treatment as recommended there.

It was finally decided to use a modification of the two above methods. Using approximately 0.5 gram samples of nylon and one gram samples of silk-nylon mixed yarns, the following treatment was given each sample.

*Morton, Avery Adrian. *Laboratory Technique in Organic Chemistry;* p. 202. McGraw-Hill Book Company, New York, 1938.
†Morton, loc. cit.

TABLE I
Effect of Calcium Thiocyanate Treatment on Nylon

Reagent — $Ca(SCN)_2$, sp. gr. 1.20-1.21 at 70° C.
Time — 5 minutes
Temperature — 70° C.

No.	Wt. (gm.) Before Treatment	Wt. (gm.) After Treatment	Percent Change	Percent Recovery	% Devia. From Average	Correction Factor
1*	0.4687	0.4729	+0.89	100.90		0.9911
2	0.4884	0.4897	+0.27	100.26	—0.02	0.9975
3	0.4692	0.4711	+0.41	100.40	+0.10	0.9960
4	0.4957	0.4957	∓ 0.00	100.00	—0.27	1.0000
5	0.4912	0.4940	+0.57	100.57	+0.27	0.9943
6	0.4708	0.4717	+0.19	100.19	—0.09	0.9981
	Average		+0.29	100.28		0.9972

*15 minute treatment.

TABLE II
Effect of Calcium Thiocyanate Treatment on Nylon In Presence of Silk

Reagent — $Ca(SCN)_2$, sp gr. 1.20-1.21 at 70° C.
Time — 5 minutes
Temperature — 70° C.

	Original Sample				
No.	Wt. (gm.) Sample	Wt (gm.) Silk	Wt. (gm.) Nylon	Percent Silk	Percent Nylon
1*	0.9415	0.4302	0.5113	45.69	54.31
2†	0.9988	0.5272	0.4716	52.78	47.22
3	0.9060	0.4366	0.4694	48.19	51.81
4	0.9193	0.4306	0.4887	46.84	53.16
5	0.9242	0.4333	0.4909	46.88	53.12
6	0.9787	0.5078	0.4709	51.89	48.09

	Analysis Data					
No.	Wt. (gm.) Residue	Percent Silk	Percent Nylon	Percent Nylon Recovery	% Devia. From Average	Correction Factor
1	0.5149	45.31	54.69	100.70		0.9930
2	0.4790	52.04	47.96	101.57		0.9845
3	0.4739	47.69	52.31	100.96	+0.36	0.9905
4	0.4918	46.50	53.50	100.63	+0.03	0.9937
5	0.4935	46.60	53.40	100.53	—0.07	0.9947
6	0.4722	51.75	48.25	100.28	—0.32	0.9972
	Average			100.60		0.9940

*15 minute treatment.
†60 minute treatment.

The weighed sample was agitated vigorously for five minutes in 40 ml. of a clear aqueous solution of calcium thiocyanate (sp. gr., 1.20-1.21 at 70° C.) made just acid to litmus with acetic acid and maintained at 70° C. ∓ 2°. The residue was separated by filtration through a weighed Gooch crucible (no asbestos mat), removed from the crucible and agitated vigorously for one minute in a fresh 40 ml. portion of calcium thiocyanate solution at 70° C. The residue was again removed by filtration through the Gooch crucible and thoroughly washed with hot distilled water until free of calcium thiocyanate as shown by testing the wash water with ferric chloride solution. The residue was dried to constant weight at 105°-110° C.

For the wool-nylon analysis. (Data given in Tables III and IV.) Since the sulfuric acid method for determining nylon in a union fabric of wool, cotton and nylon would remove both cotton and nylon, the standard method for determining cotton in the presence of wool as used by

TABLE III

Effect of 5% Potassium Hydroxide Treatment on Nylon

Reagent — 5% KOH solution
Time — 10 minutes
Temperature — Boiling

No.	Wt. (gm.) Before Treatment	Wt. (gm.) After Treatment	Percent Change	Percent Recovery	% Devia. From Average	Correction Factor
1	0.4907	0.4849	—0.27	99.75	—0.30	1.0025
2	0.4382	0.4369	—0.30	99.70	—0.34	1.0033
3	0.4791	0.4799	+0.17	100.17	+0.11	0.9984
4	0.4938	0.4929	—0.19	99.82	—0.23	1.0018
5	0.4906	0.4916	+0.20	100.20	+0.15	0.9980
6	0.4695	0.4727	+0.68	100.68	+0.63	0.9953
	Average		+0.05	100.05		0.9999

TABLE IV

Effect of 5% Potassium Hydroxide Treatment on Nylon In Presence of Wool

Reagent — 5% KOH solution
Time — 10 minutes
Temperature — Boiling

No.	Original Sample: Wt. (gm.) Sample	Wt. (gm.) Wool	Wt. (gm.) Nylon	Percent Wool	Percent Nylon
1	1.0400	0.5652	0.4748	54.36	45.65
2	1.0861	0.5949	0.4912	54.77	45.22
3	1.0517	0.5823	0.4694	55.35	44.64
4	1.1265	0.6342	0.4923	56.30	43.70
5	1.1176	0.6245	0.4931	55.88	44.12
6	1.1150	0.6736	0.4414	60.42	39.58

No.	Analysis Data: Wt. (gm.) Residue	Percent Wool	Percent Nylon	Percent Nylon Recovery	% Devia. From Average	Correction Factor
1	0.4762	54.21	45.79	100.32	+0.10	0.9968
2	0.4900	54.88	45.12	99.76	—0.46	1.0024
3	0.4710	55.21	44.78	100.34	+0.12	0.9966
4	0.4931	56.23	43.77	100.16	—0.06	0.9984
5	0.4950	55.71	44.29	100.40	+0.18	0.9959
6	0.4429	60.28	39.72	100.34	+0.12	0.9966
	Average			100.22		0.9978

TABLE V

Effect of 80% Acetic Acid Treatment on Cotton

Reagent — 80% CH_3COOH Solution
Time — 5 minutes
Temperature — Boiling

No.	Wt. (gm.) Before Treatment	Wt. (gm.) After Treatment	Percent Change	Percent Recovery	% Devia. From Average	Correction Factor
1	0.4480	0.4477	—0.07	99.93	+0.12	1.0007
2	0.4407	0.4386	—0.48	99.52	—0.29	1.0041
3	0.4415	0.4409	—0.13	99.86	+0.05	1.0014
4	0.4347	0.4347	0.00	100.00	+0.19	0.0000
5	0.4353	0.4349	—0.09	99.91	+0.10	1.0009
6	0.4452	0.4436	—0.36	99.64	—0.17	1.0036
	Average		—0.19	99.81		1.0018

TABLE VI

Effect of 80% Acetic Acid Treatment on Cotton In Presence of Nylon

Reagent — 80% CH_3COOH Solution
Time — 5 minutes
Temperature — Boiling

No.	Original Sample: Wt. (gm.) Sample	Wt. (gm.) Cotton	Wt. (gm.) Nylon	Percent Cotton	Percent Nylon
1	0.9215	0.4265	0.4950	46.28	53.72
2	0.9369	0.4227	0.5142	45.12	54.88
3	0.9555	0.4417	0.5138	46.23	53.77
4	0.9522	0.4427	0.5095	46.49	53.51
5	0.9210	0.4292	0.4918	46.60	53.40
6	0.9555	0.4466	0.5089	46.74	53.26

No.	Analysis Data: Wt. (gm.) Residue	Percent Cotton	Percent Nylon	Percent Cotton Recovery	% Devia. From Average	Correction Factor
1	0.4316	46.83	53.26	101.19	+0.49	0.9882
2	0.4240	45.25	54.75	100.31	—0.39	0.9969
3	0.4478	46.87	53.13	101.38	+0.68	0.9863
4	0.4484	47.09	52.91	101.29	+0.59	0.9872
5	0.4301	46.70	53.30	100.21	—0.51	0.9979
6	0.4453	46.60	53.40	99.79	—0.91	1.0021
	Average			100.70		0.9931

Mease and Jessup[4] and as given in specifications of the United States government[2, 3] was used to determine nylon in the presence of wool.

Approximately 0.5 gram skeins of nylon and one gram skeins of a mixture of nylon and wool were treated in the following manner:

Each sample was immersed for ten minutes in a boiling 5 per cent aqueous solution of potassium hydroxide (previously boiled to remove air). Sufficient solution was used to keep fibers covered during treatment (about 30 ml.). The solution was filtered by suction through a weighed Gooch crucible (no asbestos mat), washed once with hot distilled water, once with a 5 per cent aqueous solution of acetic acid, and then with distilled water until neutral to litmus. The residual fibers were dried to constant weight in an oven at 105°-110° C.

For the cotton-nylon analysis. (Data given in Tables V and VI). It was desired to find the concentration of acetic acid, the temperature and the length of treatment which would most effectively remove the nylon and yet least affect the cotton.

Acetic acid solutions were carefully prepared to contain the following percentages by weight of acetic acid: 95 per cent, 90 per cent, 85 per cent, 80 per cent, 75 per cent, 70 per cent, 65 per cent, 60 per cent, 55 per cent and 50 per cent. Previous tests had showed that at concentrations of less than 50 per cent no apparent disintegration of the fibers took place, even during boiling at constant volume over a period of as many as eight hours. Working with small scoured test samples (four meter lengths of yarn in 5 ml. solution) it was found that in boiling solutions of 95 per cent, 90 per cent, 85 per cent, and 80 per cent acetic acid, nylon yarns were completely dissolved in two or four seconds. At 75 per cent and 70 per cent the time for solution at the boiling point nearly doubled and the solution was less clear than at the higher concentrations. Below these concentrations solution became increasingly more difficult and the resulting solution more and more turbid.

By varying the temperature with concentrations between 99.5 per cent (glacial) and 80 per cent, fibers were found to be very slowly and difficultly soluble below a temperature of 80° C.

Acetic acid solutions of 76 per cent, 77 per cent, 78 per cent, 79 per cent, 81 per cent, 82 per cent, 83 per cent, and 84 per cent were prepared and used as above. Such

slight change in concentration was found to be negligible in affecting the solution of the fibers.

Since 80 per cent acetic acid appeared to be the lowest effective concentration for solution of nylon, tests were made to determine the temperature and time of treatment most satisfactory with this concentration. At the boiling point (about 105° C.) solution took place in three to four seconds; at 90°-95° C. in about fifteen seconds; at 85°-90° C. in about sixty seconds; at 80°-85° C. in about five minutes, with a less clear solution.

Small test samples of cotton-nylon yarns braided together were immersed in solutions of 80 per cent acetic acid at 85°-90° C. The nylon was found to dissolve five to six times more slowly in the presence of cotton than by itself. When the temperature was increased to boiling, the nylon yarn was rapidly and apparently completely dissolved from the cotton which appeared to be unaffected by the treatment.

From these preliminary experiments, the following analytical procedure was used for treating the cotton and cotton-nylon samples. Each sample was agitated in 30-35 ml. of 80 per cent by weight acetic acid for five minutes at the boiling temperature. It was transferred to 15 ml. of fresh boiling 80 per cent acetic acid and agitated vigorously for 30 seconds, again transferred to 15 ml. of fresh boiling 80 per cent acetic acid and agitated for 15 seconds and then placed in 100 ml. of hot distilled water for several minutes. It was filtered hot through a weighed gooch crucible and washed with hot water until the wash water was neutral to litmus, and dried to constant weight at 105°-110° C.

DISCUSSION OF RESULTS

From the results of qualitative tests the following plan can be set up for the qualitative identification of nylon in mixtures with the other common textile fibers of cotton, silk, wool, cellulose acetate and regenerated celluloses.

For rapid determination in an undyed fabric neocarmine gives reliable results. Nylon is dyed a pure, medium to pale green most like the color given by wool, but distinguishable from it by not having a yellowish tint and by being less intense.

In a dyed fabric a microscopical examination would be of first value. In this investigation no microscopical work was done. Von Bergen[7] gives a quite complete microscopical description and presents micro-photographs of longitudinal and cross-sectional views of nylon fibers. Cotton, wool and silk are easily distinguishable from nylon by microscopical examination; cellulose acetate and the regenerated celluloses are less readily distinguishable.

For chemical verification of the microscopical examination the following tests are of value:

To distinguish nylon from cotton: Nylon is quickly soluble in concentrated (above 80 per cent) boiling acetic acid; cotton is not.

To distinguish nylon from wool: Nylon does not give a positive test with Millon's reagent; wool does.

Nylon does not give a positive xanthoproteic test; wool does. Instead, nylon rapidly disintegrates in the cold concentrated nitric acid.

Nylon is not soluble in boiling 5 per cent potassium hydroxide; wool is.

To distinguish nylon from silk: Nylon does not give a positive test with Millon's reagent; silk does.

Nylon is not soluble in calcium thiocyanate solution of sp. gr. 1.20-1.21 at 70° C.; silk is.

To distinguish nylon from cellulose acetate: Nylon is not soluble in acetone; cellulose acetate is.

To distinguish nylon from regenerated celluloses: Nylon is not soluble in calcium thiocyanate of sp. gr. 1.36 at 70° C.; regenerated celluloses are.

The calcium thiocyanate method for analysis of silk-nylon mixtures gives acceptable results, without the necessity of applying a correction factor.

Results of the 5 per cent potassium hydroxide method of removing wool from wool-nylon mixtures show it to be a very satisfactory method for analysis of this union.

The use of acetic acid for quantitatively estimating cotton in the presence of nylon is not quite as satisfactory a method as the two preceding ones.

It will be noted that in the acetic acid treatment of cotton alone the results are consistent throughout, the per cent deviation of any one sample from the average percent recovery of cotton (99.81 per cent) being very small. However, in the presence of nylon although the average per cent recovery of cotton is 100.70, the values for individual samples show deviation from the average ranging from —0.91 per cent to +0.68 per cent. The increase in weight of the cotton residue from the cotton-nylon mixture is caused by difficulty in washing out the product formed with nylon and acetic acid, which appears as a viscous solution that rapidly solidifies as the solution cools. Apparently small amounts of it adhere to the cotton despite all care in filtration and washing. Since the cotton is only slightly affected by the acetic acid treatment used here, it is believed that a longer time of washing the cotton residue in small portions of boiling 80 per cent acetic acid would remove the traces of nylon remaining without materially affecting the cotton itself. In fact in one of the six samples analyzed the cotton residue recovered corresponded to the amount of cotton recovered when the latter was subjected to the same treatment in the absence of nylon.

However, when it is considered that an analysis by this method is correct to within less than one per cent, it is clear that this procedure can well be used, particularly when the correction factor is applied.

The carrying out of the analyses on a semi-micro scale proved very convenient, and, in view of the results given, very satisfactory. The saving in reagents and yarns required for the analysis and the greater ease of manipulation is considered an improvement over the use of larger quantities.

(Concluded on page 457)

PROCEEDINGS OF THE

American Association of Textile Chemists and Colorists

SEPTEMBER 2, 1940

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Philadelphia Textile School Student Chapter

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Members should notify the **Secretary** immediately of all address changes

• CALENDAR • OF COMING EVENTS

Meeting, Southeastern Section, Civic Room, Hotel Ralston, Columbus, Ga., September 21st, 1940. Speaker: W. D. Anderson, president of Bibb Manufacturing Co., Macon, Ga. There will also be a technical paper, the subject of which will be announced later.

Annual Meeting and Convention, auspices New York Section, October 18th and 19th, 1940, Hotel Commodore, New York City.

Meeting, Piedmont Section, Carolina Hotel, Pinehurst, N. C., November 1 and 2, 1940.

REPORT OF THE NOMINATING COMMITTEE

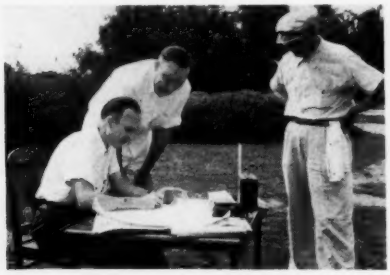
THE Councilors Representing Sections, in their capacity as Nominating Committee, have directed the Secretary to report the following nominations for the election of 1940:

For President—Carl Z. Draves.

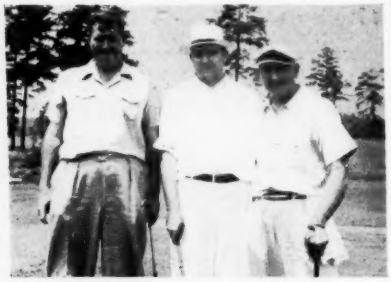
For Vice Presidents—Roland E. Derby and Thomas R. Smith.

Under the Constitution, additional nominations, each signed by at least twenty-five Senior members, filed with the Secretary not later than October eighth, will be given equal standing on the ballot.

Respectfully submitted,
HAROLD C. CHAPIN, *Secretary*

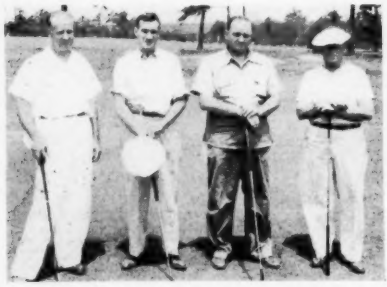


Left to right—Nestor Grotelueschen, chairman, golf tournament; Homer Whelchel; Malcolm Mackenzie.



Left to right—Henry Gaede; Homer Whelchel; Malcolm Mackenzie.

Left to right—Wallace Smith; R. J. Bicknell; Chuck Wilson; W. A. Bentel.



Left to right—I. J. Royce; P. S. Gilchrist; C. F. Nash; J. S. Neely.

Standing—Charles Glass; sitting—left to right—Homer Whelchel, chairman, men's games committee; Herbert Rodgers; John L. Dabbs, Jr.

Left to right—Frank Myers; W. O. Goolsby; William Barnes, J. W. Cassell.

"Casey at the Bat" (C. C. Cayce).

Spectators at Horseshoe Pitching Tournament.

Chairmen of outing: left to right—standing—Dan Torrence, entertainment; F. L. Kibler, chairman of section; sitting—W. J. Kelly, Jr., publicity; Jack Anderson, general chairman.

OUTING, SOUTH CENTRAL SECTION

THE summer outing of the South Central Section was held at the Lookout Mountain Hotel, August 2nd and 3rd. 250 textile chemists and colorists and their ladies attended from North and South Carolina, Georgia, Alabama and Tennessee. The South Central Section acted as host to the Southeastern and Piedmont Sections. Jack Anderson, of the Peerless Woolen Mills, was chairman of the outing.

One of the features was a golf tournament held at the Fairyland Club on Lookout Mountain. Many valuable prizes were donated for the event. Various games such as horseshoe pitching and bridge were also enjoyed by the visitors with prizes awarded the winners.

The committee assisting the chairman was composed of the following: golf—Nestor Grotelueschen; entertainment—Dan Torrence and Frank Myers; men's games—Homer Whelchel; ladies events—Mrs. Jack Anderson, Mrs. Dan Torrence, Mrs. Fletcher Kibler; general arrangements—W. S. McNabb, J. D. Mosheim, C. A. Spratt, J. H. McCall; publicity—William J. Kelly, Jr.

The winners of the golf tournament were as follows: low net, mill men—Cecil Davenport, 65, draw, Harry White, 65, draw, Bob McCamy, 65, draw; low gross, mill

Left to right—Fletcher Kibler; Jack Wyatt; C. C. Cayce; C. Calloway.

Dan Rion pitching and Marvin Moore retrieving.

Photos by J. A. Crumley Hosiery Processing Company

Left to right—W. E. Reid; George H. Small; A. R. Thompson, Jr. (driving); E. Wayman.

Left to right—Walter Jackson; Geo. McCarty; Harry White; Frank Rapp; Bill Haines.

men—R. Reece, 77, Jack Wyatt, 79, Bill Silver, 84; low gross, salesmen—R. T. Bicknell, 77, Dan Rion, 77, Pete Gilchrist, 83; low net, salesmen—J. I. White, 64, W. S. McNab, 65, W. A. Bentel, 66, draw, Frank Myers, 66, draw, Joe Bohannon, 66, draw; hole in one prize—Fletcher Kibler; most number of 7's—Malcolm McKenzie; highest score, millmen—George Wellworth, 112; blind bogey, ½ doz. golf balls each—C. A. Spratt, 96, F. W. Silver, 96, Frank Myers, 96, N. Grotelueschen, 96.

Winners of the horseshoe pitching were as follows: doubles—first, Melvin Cooper and Frank Myers, runners up, Joe Bradley and Hugh Hentz; singles—C. E. Rollins, 1st, Frank Myers, runner up.

Sack race—John Ross, 1st, J. W. Myer, 2nd.

Respectfully submitted,

FRANK MYERS, *Secretary.*

UNEMPLOYMENT REGISTER

A-1

Education—Graduate textile chemistry and dyeing course, Lowell Textile Institute, 1932. Special course in colloid chemistry at M.I.T.

Experience—Library work in spare time while attending school; five years as assistant chemist with knitting mill, duties consisting of testing and grading silk, testing of oils, soaps, dyes, finishes and other chemicals, making up specifications for various lines of hosiery and checking finished product, keeping a check on production costs, control of waste and irregulars, checking competing products and carrying on research to improve product and reduce costs. Woman; age 30; references.

A-B-7

Education—Evening school in textile dyeing and chemistry.

Experience—Dyehouse laboratory for 2 years. Foreman dyer and finisher on hosiery for 9 years. Experience on ribbons also vat dyes on rayon and silk skeins. 2 years assistant to superintendent. Desires position either in demonstrating and sales or dyer; New York Viciniy. Age 33; married.

A-B-8

Education—Graduate Chemist.

Experience—Print superintendent, colorist; eleven years' experience in all types of fabrics, specializing on rayon; 8 years' dyestuff laboratory and demonstrating. Excellent references; age 37; married.

A-B-9

Education—Bradford Durfee Textile School, 1918, chemistry and dyeing course.

Experience—Dye application, textile and color chemist; good general factory, laboratory and office experience; accustomed to assuming responsibility; handled all types of help; purchased chemicals, dyes, etc.; executive ability; good personality.

Age 42; American, married; will go anywhere for interesting work; references.

A-B-10

Education—1 year of textile chemistry, day course, Philadelphia Textile School; also business course.

Experience—3 years as apprentice in weaving mill in Germany, office and stock room, general clerical work, practice in all departments of cotton manufacture, dyeing, bleaching and finishing of cotton-rayon mixtures, piece and package processing; several mos. in laboratory of German dyestuff manufacturer, dyestuffs and assistants and their application, vat and naphthol dyeing.

Age 20; will go anywhere in U. S.

A-B-11

Education: Graduate chemist. Correspond and converse German, some French.

Experience: 3 years dyer; 4 years dyestuff testing, trouble-shooting, purchasing; 4 years demonstrating, consulting, and supervising for large dyestuff manufacturer. Thoroughly experi-

enced on rayon, cotton, silk, acetates, printing, vats. Fullest references as to character and ability. Seeks position as technician, consultant, or superintendent with reliable dyestuff sales organization or dyehouse. Age 33, married.

A-B-12

Education—Philadelphia Textile School (Evening), Chemistry and Dyeing, Quantitative and Qualitative Analysis.

Experience—Two years in yarn office, making wool stock blends. Last 6 years in dyehouse, 4 years as kettle hand, 2 years in piece dye work. Worked on yarn, raw stock and piece goods; has been dyer on union piece goods, cotton, rayon and wool, leaving wool white; also worked on all wool fabrics and woolen cross dyes; also considerable laboratory experience doing laboratory dyeings and extraction work. Seeks position as dyer or laboratory technician. Age 30; married; references.

A-B-13

Education—B.S., Chemical Engineering, Oregon State College, 1926.

Experience—First experience in dry cleaning plant; few months as sampling and control chemist with potash and chemical company; two years in dry cleaning plant, all phases of work; few months on routine and special analyses, plant problems, special studies and research for gas and electric company; 10 years teaching experience on textile chemistry, dyeing and textile testing covering all general and special courses in this field; consultant work with various mills. Seeks position in textile chemistry or dyeing.

Age 37; married; will go anywhere; references.

A-B-14

Education—Graduate of New Bedford Textile School, chemistry and dyeing course.

Experience—Two years in dyeing filament rayon skeins; seven years general laboratory work in large print works; four years overseer of package dyeing of cotton and spun rayon with all types of colors. Plant liquidating; must find other employment

Age 34; married; references.

A-B-15

Education—Graduate chemistry, dyeing and finishing course, New Bedford Textile School, 1940.

Experience—None. Seeks position in dyeing or finishing departments or in testing (chemical, physical, microscopical).

Age 27; single; references.

A-B-C-4

Education—Educated abroad.

Experience—Twenty years experience in the textile field as bleacher, dyer, finisher and chemist. 16 years in charge of dyestuff laboratory of large dyeing plant, 4 years as chief chemist with large bleachery. Has tested dyestuffs, and chemicals used in the textile field and has manufactured soaps and textile specialties. Has handled all textile fibers; bleaching, printing, dyeing and finishing same. Has done pigment and lacquer printing, waterproofing and fireproofing. Reason for leaving last position was due to business conditions. Age 41; married.

A-B-C-8

Education—B.T.C., 1933, Lowell Textile Institute.

Experience—5 months as rayon slasher tender; 8 months color matching, dye testing and analytical work; 5 years with large print works in rayon finishing department, laboratory, color matching, dye testing, assistant rayon dyer. Seeks position as rayon dyer, assistant dyer, or any job in a rayon dyeing and finishing plant. Age 29; single.

A-B-C-9

Education—Lowell Textile Institute; chemistry, dyeing and textile finishing.

Experience—Twelve years head dyer in hosiery mills. Dyeing all types of fibers and in combination. Knowledge of all dye applications. Matching and formula making. Charge of every department in a hosiery mill except fixing machinery. Has done jigg work on cottons and rayons. Desires position in hosiery, or in any field. Would like to work as an assistant to head dyer in a woolen or rayon mill. Age 42; married. Will go anywhere in the United States.

A-B-C-D-1

Education—Lowell Textile Institute, Bachelor of Textile Chemistry; Lowell Textile Institute (Evenings), 2 years D. C. Electricity; 2 years A. C. Electricity.

Experience—Six years as chemist and assistant dyer with a large organization. Specialized in dyeing, finishing, bleaching and drying of woolens, worsteds, cottons, rayons and unions in the piece. Some sales experience. Desires position as chemist, dyer, finisher, bleacher or sales. Age 30; American citizen; Married.

A-B-C-E-1

Education—3 years Chemical Engineer major in college; honor graduate Philadelphia Textile School, chemistry and dyeing course.

Experience—Ten years experience as chemist, colorist, technical director in bleaching, dyeing and finishing of cottons and rayons. Also one year's similar experience in South America. Instructor of textiles and textile chemistry in state vocational school, 2 years. Married; age 32; references; will go anywhere.

A-B-C-F-2

Education—Graduate, Lowell Textile Institute, 1908.

Experience—Over 30 years experience as chemist, color mixer and matcher, foreman printer, foreman dyer on all types of fibers and colors, and finisher. Experience installing complete dyeing and finishing departments. Experience as manager of dyeing and finishing companies. Experience in New York market: interviews with converters, obtaining orders, new customers, settling claims, etc.

Age 51; married, will go anywhere; references.

A-B-D-1

Education—Special courses in general chemistry.

Experience—Twenty-nine years' experience in application and standardization laboratories of various dyestuff manufacturers. Well versed in the application of dyestuffs to different textile fibers, i.e., wool, cotton, rayon, silk, acetate rayon and unions, using direct, acid, diazo, sulfur, acetate rayon, chrome and after-treated direct dyestuffs. Six months' actual dye house experience on jigs, open boxes, padders, bleaching and mercerizing. Experience demonstrating sulfur and direct colors at various mills. Seeks position as textile colorist in application laboratory and demonstrator. Age 46; single; references.

A-D-1

Education—Graduate of New Bedford Textile School, 1936.

Experience—Chemist for woolen mill 7 months; technician and salesman for chemical company 1 year and 9 months. Seeks position as salesman or in purchasing department.

Will go anywhere; married; references.

B-6

Education—Graduate New Bedford Textile School; also post graduate work in advanced microscopy and rayon testing.

Experience—Five weeks in color shop of print works. Wants position in anything associated with textile chemistry, dyeing, finishing and testing. Single; age 21; references.

B-7

Education—Evening course in chemistry and dyeing at Philadelphia Textile School. Evening course in chemistry at Drexel Institute.

Experience—Started as second hand in dyeworks, then two years as head dyer on women's and children's hosiery. One year as head dyer with other dye works on all types of women's hosiery including Bemberg, rayon and cotton combinations.

Age 26; married; will go anywhere in U. S.; references.

B-D-1

Education—General education in England. Chemistry and Dyeing Courses at Huddersfield Technical School.

Experience—Has been a superintendent of dyeing since 1911. Has had experience in worsted mills, hosiery mills and woolen mills. Congenial, sober and reliable. Married; references; age 53.

C-1

Experience—Thirteen years' experience in finishing all types of rayon fabrics, including spun rayons and blends. Last position also included supervision of the worsted dry finishing department. Reason for leaving last postiion: liquidation of company.

Age 39; married; will go anywhere; references.

F-1

Education—Two years high school; 6 years evening engineering school; 1 year evening textile school; 1 year industrial management; course in accounting.

Experience—Ten years in an executive capacity in full fashioned hosiery manufacturing business. Familiar with entire manufacturing procedure, finishing dept., dyehouse and office. Specialized in finishing dept. and has good eye for color, finish and quality. Had responsibility of all orders going through mill, stock, grey goods and traffic. Five months in New York sales office. Gets along well with people and contact with employees and customers has always been satisfactory. Previous to hosiery experience was in a mechanical business for 17 years.

43 years of age; single, in good health; will go anywhere.

Bibliography

on Flameproofing of Textiles*

EMILY WILLIAMS AKIN,[1] PROF. LILLY H. SPENCER,[2] and DR. A. R. MACORMAC[3]

(Concluded from last issue)

INTRODUCTION

THIS bibliography contains publications dealing principally with flameproofing of textile fabrics. Publications dealing with flameproofing of other materials have been included only when there was an indication of their adaptability to textile fabrics. It has been necessary to exercise personal judgment in the length of the abstracts used but none have been excluded because of the doubtful validity of the data given. The chief sources were Chemical Abstracts, The Abstracts Journal of Textile Institute, and Bulletins from the National Bureau of Standards. In most cases abstracts were taken directly from Chemical Abstracts or The Abstracts, Journal of Textile Institute.

This bibliography has been compiled as part of a thesis on "Methods of Testing of Flameproof Fabrics."

[1]Candidate for M.S. in Home Economics, A.P.I.
[2]Associate Professor of Home Economics, A.P.I.
[3]Associate Professor of Textile Chemistry, A.P.I.
*Contribution from the Sub-Committee on Flame Proofing, Dr. A. R. Macormac, Chairman.

INORGANIC COMPOUNDS, FIREPROOFING BY

46.—Coating and Fireproofing Fabrics.
A. Arent. U. S. 1,388,824. *Chem. Abs. 15,* 4053 (1921). U. S. 1,388,826 relates to a fire-resisting material formed of creosote and $SbCl_3$.

47.—Fireproofing Solutions.
G. Blenio. U. S. 1,382,618. *Chem. Abs. 15,* 3545 (1921). A solution for fireproofing is formed of H_2SO_4, H_3BO_3 crystals, H_3PO_4, H_2O, and sufficient NH_3 to neutralize the solution.

48.—Fireproofing, Waterproofing and Metallizing Lace, etc.
A. Norweb. Brit. 160,627. *Chem. Abs. 15,* 2361 (1921). Laces and other fabrics are fireproofed, etc., by immersion in an aqueous solution of $Na_2B_4O_7$ and Na_2SiO_3, a solution of rubber in naphtha and amyl acetate, and metal powder.

49.—Fireproofing Cotton and the Like.
Whip Bros. and Tod. Ger. 320,177. *Chem. Abs. 15,* 1223 (1921). Insoluble metal hydroxides are separated on the fiber by the action of gases, and in certain circumstances with the application of pressure.

50.—Fireproofing Cotton or Similar Fabrics.
C. L. Saunders, G. C. Stanley, and C. W. Bennett. U. S. 1,358,250. *Chem. Abs. 15,* 440 (1921). Cotton fiber is rendered more easily mpregnated with Na stannate by boiling in H_2O, treating the fiber with an aqueous solution of HF, then is rendered fire-resistant by impregnation with $(NH_4)_2SO_4$ which reacts with the Na stannate.

51.—Fireproofing and Waterproofing.
A. Arent. Brit. 174,730. *Chem. Abs. 16,* 505 (1922). Addition to 132,813. (*C. A. 14,* 359). Benzene is used as the solvent for the Sb salt in the process of compounds described in the principal patent.

52.—Fireproofing Composition.
S. Di Filippo. U. S. 1,396,264. *Chem. Abs. 16,* 651 (1922). A composition adapted for fireproofing cloth, etc., is formed of $(NH_4)_2SO_4$, $KHCO_3$, H_3BO_3, borax and water.

53.—Fireproofing Textile Fabrics.
T. J. I. Craig. U. S. 1,397,858. *Chem. Abs. 16,* 839 (1922). The materials are impregnated with an alkali metal aluminate, then with a solution of $NaHCO_3$.

54.—Fireproofing Wood, Paper or Textile Fabrics.
F. C. Wheeler. U. S. 1,414,609. *Chem. Abs. 16,* 2207 (1922). The material is boiled in a solution formed from H_2O, borax. and alum.

55.—Fireproofing Fibrous Materials.
A. Arent. U. S. 1,418,610. *Chem. Abs. 16,* 2761 (1922). A solution of $SbCl_3$ is applied.

56.—Rendering Kapok and other Fibers Incombustible.
R. C. Valls. U. S. 1,422,242. *Chem. Abs. 16,* 3178 (1922). The fiber is treated with alcohol or other solvent of low b.p. and with ammonium phosphate.

57.—Fireproofing Material.
A. Arent. Can. 229,246. *Chem. Abs. 17,* 2036 (1923). Materials are rendered noninflammable by treatment with $SbCl_3$ in a solvent comprising Am Acetate.

58.—Fireproofing Material.
Taizan Shiga. Japan 41,008. *Chem. Abs. 17,* 2158 (1923) . . . Addition to 40,506 (*C. A. 17,* 1870). The material is a mixture of borax, $MgSO_4$; AcOH is used as a solvent of Mg borate.

59.—Waterproofing and Fireproofing Fibrous Materials.
A. Arent. Can. 230,237. *Chem. Abs. 17,* 2367 (1923). A mixture of a drying oil, amyl acetate and a fire-retardant Sb compound is used.

60.—Fireproofing Agent.
Taizan Shiga. Japan 40,506. *Chem. Abs. 17,* 1870 (1923). Borax and boric acid are dissolved into H_2O and mixed with $Al_2(SO_4)_3$ in H_2O.

61.—Fireproofing Composition.
L. W. Andrews and L. D. Mathias. U. S. 1,501,895. *Chem. Abs. 18,* 2949 (1924). An aqueous solution which does not deposit crystals under ordinary atmospheric conditions and which is adapted for use in fireproofing textile fabrics or other materials is formed from a borate and an alkali metal phosphate.

62.—The Fireproofing of Textile Fibers.
Ismar Ginsberg. *Textile Colorist 46,* 363-5 (1924). *Chem. Abs. 18,* 3115 (1924). *J. Textile Inst. 15,* A190 (1924). A brief discussion of the Na_2SnO_3 method.

63.—Fireproofing Composition.
W. G. Lindsay. U. S. 1,534,631. *Chem. Abs. 19.* 1760 (1925). NH_4Al fluoride or other Al fluoride is used with pyroxylin or other substances.

64.—Fireproofing Artificial Silk.
R. Lavaud. Brit. 227,855. *Chem. Abs. 19* (1925). The material is impregnated with a solution of NH_4 carbonate and sulfate. H_3BO_3, borax and starch.

65.—Fabrics and Fibers: Fireproofing.
T. J. I. Craig and P. Spence and Sons. E. P. 244,503. *J. Textile Inst. 17,* A111 (1926). U. S. 1,593,752. *Chem. Abs. 20,* 3216 (1926). Fabrics are fireproofed by successive treatment with a solution of

alkali aluminate and carbon dioxide, and the proofing matter is fixed in a boiling solution.

66.—Artificial Silk: Fireproofing.
Textile Merc., 75, 387 (1926). E. P. 595,286. *J. Textile Inst. 17,* A416 (1926). The material is treated with an almost saturated solution of ammonium sulphate, and the liquid is thickened with neutral starch—tragacanth paste

67.—Fireproofing Textiles.
Dyer and Calico Printer, 55, 60 (1926). *J. Textile Inst. 17,* A108 (1926). A process for fireproofing materials by deposition within them of alumina.

68.—Fireproofed Cellulose Ester Composition.
C. E. Burke. U. S. 1,633,067. *Chem. Abs. 21,* 2558 (1927). Hydrated Mg carbonate is used with cellulose nitrate or other cellulose ester and a plasticizing agent.

69.—Artificial Silk: Fireproofing.
J. R. Levand. E. P. 251,227. *J. Textile Inst. 17,* A278 (1926). *Chem. Abs. 21,* 1362 (1927). Nitrocellulose yarns are rendered incombustible by treatment with formic or acetic acid, an alkali metal sulphide and magnesium sulphate, an alkali metal hydrosulphite, aluminium chloride, and ammonium sulphate, commercial ammonium carbonate, boric acid, and borax.

70.—Compn. for Stiffening and Fireproofing Cellulosic Sheet Materials.
C. R. Felix. U. S. 1,643,116. *Chem. Abs. 21,* 3743 (1927). *J. Textile Inst. 19,* A135 (1928). A composition suitable for treating cloth is formed of 40° Bé. Na silicate solution, Na tungstate and a stabilizing substance.

71.—Water-Soluble Sulfonated Cellulose Derivatives.
I. G. Farbenind. Brit. 277,317. *Chem. Abs. 22,* 2465 (1928). Cellulose in the form of an alkaline compound is caused to react with an aralkyl-halide-sulfonic acid.

72.—Composition for Fireproofing and Preserving Wood, Paper, Cloth, etc.
Taisan Shiga. U. S. 1,674,802. See Can. 270,490. (*C. A. 21,* 3434). *Chem. Abs. 22,* 3026 (1928). A fireproofing composition consists of a slightly acid solution of Mg borate, $(NH_4)_2SO_4$ and Na cresolate.

73.—Fireproof Impregnation of Cloths.
E. Kohler. *Text. Merc. 77,* 401 (1927). *J. Textile Inst. 19,* A71 (1928). The author suggests dissolving aluminum sulphate in dry, white form in water and pour into this a saturated solution of ammonium phosphate, add spirits of salammoniac until a clear liquid is obtained. Material treated in this way was attacked by fire, but did not burst into flames. Excellent results can be obtained with sodium tungstate.

74.—Fireproofing.
Soc. Lemercier Freres. Fr. 656,693. *Chem. Abs. 23,* 4310 (1929). Ammonium phosphate alone or with Na stannate is used for fireproofing. Fr. 656,694 describes a process by which fireproofing substances are crystallized in the cloth.

75.—Waterproofing and Flameproofing Compns. for use on Textiles.
Frank L. Roman. U. S. 1,720,747. *Chem. Abs. 23,* 4353 (1929). Use of rubber latex and NH_4 polysulfide.

76.—Composition for Fireproofing Cloth, etc.
Charles Lichtenstadt. U. S. 1,691,726. *Chem. Abs. 23,* 491 (1929). *J. Textile Inst. 20,* A268 (1929). $ZnNH_4$ phosphate, mono-NH_4 phosphate and NH_4Cl are used together.

77.—Fireproofing Various Combustible Materials.
DuPont Viscoloid Co. Brit. 289,936. *Chem. Abs. 23,* 944 (1929). The material is treated with a hydrated Mg carbonate either as a coating or impregnating substance which may be mixed with rubber solution, varnishes, etc., for application to fabrics.

78.—Fireproofing Articles.
George Rouyer. Fr. 643,531. *Chem. Abs. 23,* 1483 (1929). Material is covered with a layer of K_2SiO_3, and with one or more layers of a colorless varnish composed of "Colle d'or" and pyrene.

79.—Fireproofing Cellulose Material.
H. Platt and C. Dreyfus. Brit. 296,344. *Chem. Abs. 23,* 2569 (1929). *J. Textile Inst. 20,* A41 (1929). Materials are treated with phosphoric acids, acid phosphates, arsenic acids, or stibinic acids; other fireproofing agents such as Al acetate may be present.

80.—Fireproofing and Fire-Extinguishing Compositions.
I. G. Farbenind. Brit. 302,172. *Chem. Abs. 23,* 4310 (1929). A small quantity of an alkylated or aralkylated sulfonic acid or water-soluble salt of such an acid such as Na butylnaphthalene sulfonic or NH_4 benzylnaphthalene sulfonate is used with other substances such as Al sulfate and $NaHCO_3$, NH_4Cl or CCl_4.

81.—Fireproofing Paper, Teextiles, etc.
Westfalisch-Anhaltische Sprengstoff. *Chem. Fabrik.* Ger. 474,186. *Chem. Abs. 23,* 3100 (1929). The material is impregnated with a solution of $ZnNH_4$ chloride.

82.—Fireproofing Composition.
Taisan Shiga. U. S. 1,720,926. *Chem. Abs. 23,* 4354 (1929). NH_4 phosphate and $(NH_4)_2SO_4$ in water with solution of Mg borate in boric acid solution is used.

83.—Fireproofing Solution.
S.A.I.G. Fr. 686,144. *Chem. Abs. 24,* 5953 (1930). Brit. 336,863. *Chem. Abs. 25,* 1959 (1931). *J. Textile Inst. 22,* A197 (1931). Contains NH_2Cl or $(NH_4)_2CO_3$, boric acid, NaCl, NH_3 and water.

84.—Fireproofing.
I. G. Farbenind. Fr. 665,464. *Chem. Abs. 24,* 934 (1930). E. P. 326,253. *J. Textile Inst. 21,* A309 (1930). Small quantities of alkyl or aralkyl aromatic sulfonic acids are added to aqueous solutions of uninflammable substances such as $(NH_4)_2SO_4$, NH_4Br, or Na_2CO_3.

85.—Fabric: Flame Proofing.
British Fire Prevention Committee. *Ind. Eng. Chem. 22,* 164 (1930). *J. Textile Inst. 21,* A251 (1930). The process consists in steeping the cloth in a solution of sodium stannate passed through a solution of ammonium sulphate. The effect remains after the material has been subjected to washing or weather. A less permanent treatment can be made by subjecting to a solution of ammonium sulphate and ammonium chloride in water. Sodium silicate is fairly effective where change of color or luster is not important.

86.—Fireproofing of Rayon Fabrics.
A. N. Hay. *Rayon Record 4,* 431-3 (1930). *Chem. Abs. 24,* 3376 (1930). Among various materials described, Na tungstate and Sn tungstate are called the best. Cellulose acetate film is occasionally applied.

87.—Treating Inflammable Materials.
Gottlieb Tranchslin, Jr. and Ernst Greber. Swiss 133,869. *Chem. Abs. 24,* 1713 (1930). Material is rendered non-inflammable by treatment with mixed solutions of volatile and non-volatile salts.

88.—Fireproofing and Vermin-proofing Wood, Fabrics, and Other Cellulosic Materials.
Sir G. C.Marks. Brit.321,786. *Chem. Abs. 24,* 2849 (1930). *J. Textile Inst. 21,* A148 (1930). The material is treated with an ammoniacal solution of arsenious acid or oxide from which free As_2O_3 is deposited on exposure to the air.

89.—Fireproofing Artificial Silk.
Jacques Delpech. Fr. 36,432. Addition to 561,614. *Chem. Abs. 24,* 6035 (1930). In fireproofing artificial silk mixed with other textiles the phosphoric ester of BuOH or other alcohols is used as a substitute for camphor.

90.—Textile Fabrics: Fireproofing
J. Y. Johnson. E. P. 334,408. *J. Textile Inst. 21,* A675 (1930). Ammonium phosphate or sulphate, silicates, or zinc salts and urea-formaldehyde condensation products are used.

91.—Vegetable Fibers: Chroming and Fireproofing.
E. P. 324,358. *J. Textile Inst. 21,* A254 (1930). Treated with a solution comprising a chromate or bichromatee of a fixed alkali and a sulphoxylate compound, in the absence of ammonia, and then aged.

92.—Fireproofing.
I. G. Farbenind. Ger. 507,104. *Chem. Abs. 25,* 568 (1931). Addition to 503,673. The material is treated with halogenated aromatic esters of H_3PO_3 and H_3PO_4, instead of the anilides of these acids. (*C. A. 24,* 6035). Trichlorophenyl phosphite is mentioned.

93.—Non-Inflammable Fabric.
Allan F. Randolph. U. S. 1,820,198. *Chem. Abs. 25,* 5741 (1931). A porous fabric has its interstices filled with a powder colloidal material in precipitated form forming a porous deposit capable of ready penetration by solvents, together with a fire-retardant.

94.—Rendering Fiber Non-inflammable.
I. G. Farbenind. Ger. 525,646. *Chem. Abs.* 4709 (1931). Fiber is rendered non-inflammable by impregnating with salts producing this effect, and treating with dichloronaphthalene.

95.—Fireproofing Wood, Textile Fabrics, etc.
I. G. Farbenind. Brit. 334,408. Same as No. 90.

95a.—Fireproofing Wood and Other Fibrous Materials.
Ralph H. McKee, U. S. 1,804,633. *Chem. Abs. 25,* 3802 (1931). The materials are treated with a solution of NH_4 phosphate in the presence of free NH_3.

96.—Fireproofing Porous Materials.
Harry Hopkinson. U. S. 1,797,865. *Chem. Abs. 25,* 2862 (1931). The material is treated with a solution of a Pb salt and then treated with a solution of a halide.

97.—Fireproof Fabric.
H. Platt and C. Dreyfus. Can. 307,239. *J. Textile Inst. 22,* A354 (1931). U. S. 1,837,150. *Chem. Abs. 26,* 1137 (1932). A fabric containing yarn of cellulose acetate is immersed with an aqueous solution of H_3PO_4.

98.—Fire-resisting Rayon Goods.
Fred. Grove-Palmer. *Am. Dyestuff Reptr. 19,* 715-6 (1930). *Chem. Abs. 25,* 212 (1931). The old method consists of a 10 per cent Na phosphate, 2 per cent Na tungstate and ½ per cent NH_4Cl. For heavy cloths are used 6 lbs. of NH_4Cl, 3 lbs. NH_4 phosphate in 6 gals. water. For fireproofing and waterproofing, Na phosphate followed by a 5 per cent solution Al acetate is used.

99.—Note on a Little-known Fireproofing Process.
E. Dutoit. *Tiba 9,* 33 (1931). *Chem. Abs. 25,* 1679 (1931). Perkin's method consists in impregnating flannel with a 26° Bé. Na stannate solution, draining, drying between heated Cu rolls, treating with a 10° Bé. $(NH_4)_2SO_4$ solution to ppt. $Sn(OH)_4$, draining, drying, washing and drying again. The resultant fireproofing is permanent, as the SnO_2 is combined with the fiber; it increases the mechanical strength of the fabric and its resistance to washing and ironing, and it acts as a mordant if it is to be dyed.

100.—Fireproofing and Waterproofing Textile Materials.
U. S. 1,821,317. Harold R. Offord and Nicholas T. Mirov. *Chem. Abs. 25,* 5998 (1931). *J. Textile Inst. 23,* A558 (1932). The material is immersed in a 45° Tw. solution of Na stannage, soaked in a 15° Tw. solution of $(NH_4)_2SO_4$, treated with cold water, soaked in a solution of not more than 1 per cent of gilsonite in benzene.

101.—Fireproofing Preparation.
I. G. Farbenind. Ger. 538,940. *Chem. Abs. 26,* 2289 (1932). E. P. 365,012. *J. Textile Inst. 23,* A328 (1932). *Chem. Abs. 27,* 3049 (1933). The preparation consists of a mixture of halogen NH_4 salts, salts of aromatic sulfonic acids benzylated in the nucleus, and H_3BO_3 or H_3PO_3 or the aqueous solution salts of the latter acids.

102.—Fireproofing Materials.
I. G. Farbenind. Fr. 709,300. *Chem. Abs. 26,* 1456 (1932). Fibrous materials are rendered fireproof by impregnation with solutions of inorganic salts and then with dichloronaphthalenes.

103.—Chlorinated Rubber Composition for Rendering Fabrics Resistant to Water and Fire.
Carleton Ellis. U. S. 1,85.,998. *Chem. Abs. 26,* 3122 (1932). Coated with a chlorinated rubber compound containing an aryl phosphate, and a substance such as di-Et phthalate.

104.—Fire- and Water-proofing Material.
Fritz Fuchs. Brit. 376,407. *Chem. Abs. 27,* 3624 (1933). *J. Textile Inst. 23,* A617 (1932). The fabric is impregnated with a waterproofing agent and a substance that develops fire-extinguishing gases on heating.

105.—Treating Textiles.
British Bemberg. Brit. 378,760. *Chem. Abs. 27,* 3621 (1933). Treated with aqueous solutions of compounds of metal oxide—NH_3 with amphoteric metal oxides.

106.—Fireproofing Textiles.
H. Dreyfus. Fr. 735,919. *Chem. Abs. 27,* 1213 (1933). Textiles are fireproofed by the addition of a metal compound relatively insoluble in water such as a phosphate or borate of a heavy metal, or a salt of a metal and NH_4.

107.—Fireproofing Agents.
I. G. Farbenind. Ger. 566,278. *Chem. Abs. 27,* 1121 (1933). Use is made of halogenated aliphatic esters of H_3PO_3.

108.—Fireproofing Textiles.
Edouard Courbon. Fr. 736,292. *Chem. Abs. 27,* 1525 (1933). Textiles are rendered fireproof by treatment with a solution containing $(NH_4)_2SO_4$ and $(NH_4)_2HPO_4$.

109.—Fire-resistant and Preservative Composition Suitable for Wood, Paper, Canvas, etc.
Joseph R. Watson. U. S. 1,900,211 and 1,900,212. *Chem. Abs. 27,* 3049 (1933). Cryolite or an alkali metal fluosilicate and an alkali metal silicate are used with an oil.

110.—Impregnated Textile Materials with Degelled Linseed Oil, etc.
Harry W. Turner. U. S. 1,901,678. *Chem. Abs. 27,* 3346 (1933). Fabric is singed, treated with powdered talcum, impregnated with degelled linseed oil, air dried and re-treated with powdered talcum.

111.—Fireproofing Wood or Textile Fabrics.
Arthur P. Allen. U. S. 1,926,253. *Chem. Abs. 27,* 5931 (1933). The material is treated with an aqueous solution containing a borate salt to which is added a smaller amount of a saccharide. NaF, As compounds, etc., also may be added.

112.—Fireproofing.
Anciens Etablissements R. Bailly S. A. Fr. 746,449. *Chem. Abs. 27,* 4643 (1933). Materials are fireproofed by applying an appropriate adhesive and when dry, applying powdered mica.

113.—Fireproofing Textile Materials.
H. Dreyfus. Brit. 385,322. *Chem. Abs. 27,* 4423 (1933). *J. Textile Inst. 24,* A214 (1933). The fireproof properties are increased by incorporation of water-insoluble metallic compounds that evolve non-inflammable vapors and form a fused product at not exceeding red heat. (Cf. *C. A. 27,* 1213.)

114.—Ammonium Sulfate.
H. E. Millson. *Melliand Textile Monthly 4,* 42-4, 121-4, 189-91, 251-2 (1932). *Chem. Abs. 27,* 3338 (1933). Formulas are given for fireproofing textile materials by means of $(NH_4)_2SO_4$.

115.—Rendering Fibrous Materials Non-inflammable.
Rudolf Engelhardt. U. S. 1,938,746. *Chem. Abs. 28,* 1552 (1934). The material is impregnated with an organic salt, then dried and treated with dichlorinated naphthalene.

116.—Firepreventing Salts.
I. G. Farbenind. Ger. 592,777. *Chem. Abs. 28,* 3544 (1934). A preparation for rendering materials non-inflammable consists of

a mixture of NH_4 phosphate with salts of H_3BO_3 and nuclear benzylated aromatic solfonic acids. (Cf. *C. A. 27,* 3049.)

117.—Fireproofing Cellulose Materials and Fabrics.
Martin Leatherman. U. S. 1,961,108. *Chem. Abs. 28,* 4597 (1934). U. S. 2,012,686. *Chem. Abs. 29,* 7098 (1935). (Cf. *C. A. 28,* 4597.) Saturated with an aqueous solution of a metallic salt of a sulfate ester of an aliphatic alcohol and then impregnated with Na stannate, immersed in an aqueous solution of a salt of a strong inorganic acid with a weakly base-forming metal the hydroxide of which is insoluble in water, impregnated with chlorinated rubber.

118.—Flameproofing Materials Such as Cloth.
Frederick W. Hochstetter. U. S. 1,961,045. *Chem. Abs. 28,* 4612 (1934). An aqueous solution is used formed from HCl, NH_3, HOAc, H_2SO_4, phenol and formaldehyde, in specified proportions.

119.—Waterproofing and Fireproofing Fabrics, etc.
Fredrich Eckstein. Austrian 136,953. *Chem. Abs. 28,* 4612 (1934). The material is impregnated with an alcoholic solution containing a resin, fat or like substance and a non-hydrolyzing salt of a metal of the 2nd periodic group.

120.—Fireproofing.
Stanley C. Smith. Brit. 405,673. *Chem. Abs. 28,* 5194 (1934). *J. Textile Inst. 25,* A196 (1934). Materials are fireproofed by treatment with an $(NH_4)_2SO_4$ solution buffered to prevent corrosion of metallic bodies.

121.—Fireproofing Composition.
St. Helens Cable and Rubber Co. E. P. 404,691. *J. Textile Inst. 25,* A299 (1934). Use of a solution, in carbon tetrachloride, of rubber, selenium, carbonates, and softening agents.

122.—Flame- and Water-proofing Composition for Treating Materials.
Frederick W. Hochstetter. U. S. 2,003,148. *Chem. Abs. 29,* 4954 (1935). Details are described for the preparation of a compound consisting of substances such as $(NH_4)_2SO_3$, $(NH_4)_2CO_3$, water, soap, NH_4Cl, borax, gelatin, glycerol, dextrin, soapbark and alum. (Cf. *C. A. 28,* 4612.)

123.—Fire-resistant Binder Finish.
Laura W. Van Dyke. U. S. 1,994,492. *Chem. Abs. 29,* 3076 (1935). $MgCl_2$ is used with vinegar or with a mixture of magnesite and asbestos.

124.—Wetting and Emulsifying Agents.
Ernst Berl. Brit. 426,785. *Chem. Abs. 29,* 6332 (1935). Sulfonic acids or salts thereof are recovered from acid tar by various methods given. The NH_4 salts are useful as fireproofing agents.

125.—Fireproofing.
I. G. Farbenind. Fr. 779,804. *Chem. Abs. 29,* 5551 (1935). Textiles are fireproofed by treatment with salts, solution in water, of amides obtained by the reaction of fat acids or naphthenic acids with aliphatic amino carboxylic acids.

126.—Fireproofing Cellulosic Materials Such as Fabrics Exposed to the Weather.
Martin Leatherman. U. S. 2,017,805. *Chem. Abs. 29,* 8363 (1935). The material is saturated in a 1 per cent aqueous solution of a metallic salt of a sulfate ester of an aliphatic alcohol, impregnated with Na stannate, immersed in an aqueous solution of a salt of a strong inorganic acid with a weakly base-forming metal, the hydroxide of which is water-insoluble, impregnated with chlorinated petroleum derivatives.

127.—Fireproofing and Preserving Cellulose Materials and Fabrics.
Martin Leatherman. U. S. 1,990,292. *Chem. Abs. 29,* 1984 (1935). Impregnated with Na stannate, immersed in a solution of a salt of a strong inorganic acid with a weakly base-forming metal the hydroxide of which is water-insoluble, such as a solution of an alum containing Fe or Cr.

128.—Coloring and Flameproofing Material.
Frederick W. Hochstetter. U. S. 2,045,139. *Chem. Abs. 30,* 5786 (1936). A metagelatin - ammonium carbonate - ammonium sulfate solution is mixed with a boric acid solution and with a solution of $ZnSO_4$ and a dye in acidified solution, and a diluted aqueous lime-soap suspension containing a small amount of starch is added.

129.—Colloidal Solutions.
I. G. Farbenind. Brit. 441,206. *Chem. Abs. 30,* 4587 (1936). Hydroxides of trivalent metals or colloidal solutions thereof, are obtained by treating the metal salts with dissolved, liquid or gaseous NH_3 or other N compounds, suitable for the formation of hydroxides in an amount greater or less than the stoichiometrical proportion and then subjecting the product to a protective drying, before or during peptization with acid. The products are used to reduce inflammability.

130.—Fireproof Coatings.
Ruhrchemie. Fr. 791,983. *Chem. Abs. 30,* 4244 (1936). These are composed of condensation products of dicyanodiamide with aldehydes, with an addition of NH_4 salts.

131.—Waterproofing and Fireproofing Paper and Fabrics.
Yvonne A. R. Leroy. Brit. 440,026. *Chem. Abs. 30,* 4008 (1936). Materials are impregnated with an insoluble salt of a higher fatty acid. Salt of the acid and a metallic salt that precipitates the acid, and the impregnated material is treated with a fireproofing solution and with a solution of a gelatin or other albuminous substance that is hardened.

132.—Fireproofing Artificial Materials.
Wm. A. Dickie and Frank B. Hill. U. S. 2,036,854. *Chem. Abs. 30,* 3664 (1936). The material is treated with a halide of a volatile base such as NH_4Br and with a phosphate or borate of a volatile base such as NH_4 phosphate.

133.—Weighting and Processing Rayon, etc.
Donald Finlayson and Charles E. Stafford. Brit. 439,203. *Chem. Abs. 30,* 3256 (1936). Mineral substances other than weighting substances are those for increasing the safe ironing point or fire resistance of the materials.

134.—Fireproofing Textile Yarns and Fabrics.
Wm. Whitehead. U. S. 2,032,605. Can. 355,242. (*C. A. 30,* 2022.) Brit. 437,226. (*C. A. 30,* 2407.) *Chem. Abs. 30,* 2776 (1936). Materials of organic derivatives of cellulose are treated with an alkylamine salt of an inorganic acid.

135.—Fireproofing Compositions.
Grete Kindermann. Brit. 435,240. *Chem. Abs. 30,* 1907 (1936). A compound for fireproofing consists of an aqueous solution of $(NH_4)_2SO_4$, NH_4Cl, H_3BO_3, and borax, to which is added a small amount of a urea-CH_2O condensation product.

136.—Fireproofing Compositions.
Rudhall J. White and W. R. Dauncey. Brit. 433,645. *Chem. Abs. 30,* 794 (1936). The compositions consist of equal parts of K_2CO_3 and $NaHCO_3$ dissolved in a suitable liquid.

137.—Modern Flameproofing.
N. L. Deutsch. *Textile Colorist 58,* 600-3 (1936). *Rayon Textile Monthly 17,* 689-90, 747-8 (1936). *Chem. Abs. 30,* 8625 (1936). "Abopon" is claimed to meet the specifications for a satisfactory flameproofing agent. It is an "inorganic borophosphate resin," soluble in water but not in organic solvents. Treated fabrics withstand dry cleaning, showed no noticeable loss in strength.

138.—Fireproofing Rayon.
F. R. Urban. *Kunstseide 17,* 440-3 (1935). *Chem. Abs. 30,* 2392 (1936). A number of known processes involving treatment with hydrated salts, NH_4, etc., are described.

139.—Fireproofing Composition.
Benjamin H. Pring. Can. 368,886. *Chem. Abs. 31,* 8765 (1937). A fireproofing composition consists of NH_4SO_4, borax, boric acid and water.

140.—Fireproofing and Waterproofing Agent.
Zsigmond Medveezky. Hung. 116,654. *Chem. Abs. 31,* 8080 (1937). An aqueous solution of a phosphate is mixed with dextrin dissolved in hot water, and a water-glass solution of 35° Bé. is added. A solution of Ca hypophosphite or a diluted $Ca.(OH)_2$ solution is used as a basic agent.

141.—1,3,5-Xylenon Phosphate.
Celluloid Corp. Brit. 450,891. *Chem. Abs. 31,* 187 (1937). 1,3,5-Xylenol or an alkali metal salt thereof is esterified with a phosphating agent.

142.—Fireproofing and Waterproofing Fabrics.
Victor Pollack. Austrian 149,561. *Chem. Abs. 31,* 6482 (1937). A fabric is made fireproof by impregnation with a solution of $PhPCl_2$ or like water-insoluble reaction product of an aromatic compound and a chlorine compound of P.

143.—Fireproof and Refractory Coatings.
Paul M. R. Mure de Pelanne. Fr. 808,086. *Chem. Abs. 31,* 6382 (1937). An alkali silicate is mixed with a substance which will form an insoluble composition with the silicate and a metal powder is added to the mixture.

144.—Fireproofing Compositions.
Wilhelm Bickel. Ger. 645,250. *Chem. Abs. 31,* 5910 (1937). Known inorganic fireproofing substances are mixed with modified starch which is soluble in water.

145.—Fireproofing Compositions.
"Antignis" Chem.-Technische Schutzstoffe. Austrian 149,356. *Chem. Abs. 31,* 5488 (1937). A mixture containing anhydride $CaCl_2$, $ZnCl_2$, and CH_2O is mixed with a mixture containing anhydrous $CaCl_2$, H_3BO_3 and NH_4Cl.

146.—Fireproofing Composition.
Julius Sumichrast and Sandor A. Molnar. Can. 365,911. *Chem. Abs. 31* (1937). $Al_2(SO_4)_3$, NH_4SO_4 and NH_4Cl are dissolved in water, borax, $B(OH)_3$ and K silicate are added, and CCl_4 and $(CH_2Cl)_2$ are added under constant agitation.

147.—Fireproof Fibers.
The Agasote Millboard Co. Ger. 639,887 *Chem. Abs. 31,* 4024 (1937). Organic fibers are treated with a thick suspension of colloidal clay such as bentonite, to which insoluble or almost insoluble crystals, especially $CaSO_4$ crystals, are added.

148.—Distributing Metal Compound in Liquid Media or on Porous Substances.
Acetu G.M.B.H. Ger. 642,442. *Chem. Abs. 31,* 3348 (1937). A liquid containing a metal salt, or a porous substrate impregnated with a metal salt solution, is treated with an alkalene oxide, whereby a fine dispersion of metal oxide, hydroxide or basic salt in the liquid or on the substance is obtained.

149.—Fireproofing Processes.
I. G. Farbenind. Ger. 642,203. *Chem. Abs. 31,* 3604 (1937). An aqueous solution of suitable inorganic salts, in which the penetration of the salts into the materials is assisted by adding a neutralized reaction product of amide character derived from a higher aliphatic or naphthenic acid and an aliphatic aminocarboxylic acid.

150.—Fireproofing Wood, etc.
I. G. Farbenind. Fr. 803,857. *Chem. Abs. 31,* 2720 (1937). The compound contains a mixture of water-soluble salts of lower fat acids the anion of which volatilizes easily under the influence of flame but the cation of which volatilizes difficulty or not at all.

151.—Fireproofing Wood, Fabrics, etc.
H. Beylerian. Belg. 415,713. *Chem. Abs. 31,* 2720 (1937). A bath of $(NH_4)_2SO_4$ and $Na_2B_2O_7$ is used.

152.—Fireproofing Composition.
Victor J. Truro. Brit. 453,109. *Chem. Abs. 31,* 1130 (1937). The composition consists of $(NH_4)_2HPO_4$, NH_4, Cl, borax and Na_2WO_4. $2H_2O$ in powder form or compressed into a block.

153.—Fireproofing.
Soc. Anon. Achod Fringhian et Fils. Fr. 826,931. *Chem. Abs. 32,* 6767 (1938). Textiles and other inflammable materials are impregnated with a cold solution containing $(NH_4)_2SO_4$ and borax.

154.—Halogenated Hydrocarbon Solvents.
Peter J Wiezerich and Hans G. Vesterdal. U. S. 119,873. *Chem. Abs. 32,* 5960 (1938). A mixture of petroleum hydrocarbons is chlorinated in the absence of metals of the Fe group, to a Cl content of 20-40 per cent, and the product is fractionated in the absence of metals of the Fe group and without substantial decomposition; suitable for fireproofing.

155.—Fireproofing Compositions.
Andre Fontaine. Fr. 825,015. (Fireproofing Materials. V. J. Truro. Fr. 821,117. *C. A. 31,* 1130.) *Chem. Abs. 32,* 5544 (1938). A mixture of Na silicate with subordinate proportions of ZnO and a subdivided metal.

156.—Fireproofing Composition.
Julius Sumichrast and Sandor A. Molnar. U. S. 2,111,704. *Chem. Abs. 32,* 3870 (1938). Al sulfate, NH_4 sulfate, borax and boric acid dissolved in water, are used with K silicate and CCl_4 and $C_2H_4Cl_2$.

157.—Fireproofing Materials.
Riccardo Campese. Fr. 817,321. *Chem. Abs. 32,* 2258 (1938). *J. Textile Inst. 29,* (1938). Materials are fireproofed by treatment with a solution of a mixture of substances which liberate a protecting gas when heated.

158.—Fireproofing Textiles.
Edgar Boulogne and Soc. Industrielle des Derives du Soufre. Fr. 815,454. *J. Textile Inst. 29,* A350 (1938). *Chem. Abs. 32,* 1950 (1938). Cloth and other products are impregnated with a solution of $Zn(H_2PO_4)_2$ and exposed for a sufficient time in an atmosphere of gaseous NH_3 to transform the $Zn(H_2PO_4)_2$ to insoluble $Zn(NH_4)PO_4$.

159.—A Weather-resistant Fireproofing Treatment for Cotton Fabrics.
Martin Leatherman. U. S. Dept. Ag. Circ. 466, 17 pp. (1938). *Chem. Abs. 32,* 7276 (1938). The effectiveness of SnO_2 in flameproofing fabrics can be increased by using $Fe_2(SO_4)_3$ in place of $(NH_4)_2SO_4$ for fixing the SnO_2 on the fabric. A method is described for preparing a new fireproofing resin by chlorinating a mixture of paraffin wax and a paraffin-base petroleum oil. Fabrics subjected to the combined oxide-resin treatment remained completely fireproof after exposure to the weather for 6 mo.

160.—Fireproof Rayon Fabrics.
H. Roche. *Silk J. 14,* No. 162, 20 (1937). *Chem. Abs. 32,* 787 (1938). A permanent finish is obtained by bathing in Na tungstate and drying; this is followed by tin chloride.

161.—Sulphamic Acid: Production and Application in Flameproofing.
M. E. Cuprey. *Indust. Eng. Chem. 30,* 627-631 (1938). *J. Textile Inst. 29,* A539 (1938). A new process for the production of sulphamic acid is based on the reaction of urea with fuming sulphuric acid. This material on fabric does not cause stiffening. Sulphamates are not removed by dry cleaning.

162.—Fireproofing Cellulosic Fibers.
Ralph R. Oliver. Can. 363,902. *Chem. Abs. 33,* 9010 (1939). The fibers are impregnated with a solution of $Na_2B_4O_7$ and $B(OH)_3$ at pH 7-7.4.

163.—Coating Compositions.
Sydney Beckinsale and Stuart H. Cox. Brit. 504,312. *Chem. Abs. 33,* 8043 (1939). A non-sticky, waterproof and fireproof coating composition comprises a Pb pigment, linseed oil that has been air-blown and a linoleate as drier.

164.—Fireproofing Composition Suitable for Use on Textiles.
Martin Leatherman. U. S. 2,167,278. *Chem. Abs. 33,* 9010 (1939). A mixture of a plurality of mutually precipitated oxides including at least one of the oxides SnO_2, CuO, MoO_2 and PbO_2 is used in suspension in a chlorinated resin or chlorinated wax-oil mixture which will liberate HCl when heated.

165.—Fireproofing; Waterproofing.
Etablissments Bouillon Freres. Brit. 504,-480. *Chem. Abs. 33,* 7936 (1939). Materials are rendered fireproof by treatment with a composition obtained by causing an Al salt, NH_3 and an oxygenated acid, or a sugar or a polyhydric alcohol, to react together.

166.—Fireproofing and Coloring Paper and Textiles.
Chemische Werke Albert (Katl Uhl, Inv.). Ger. 674,633. *Chem. Abs. 33,* 7112 (1939). Materials are simultaneously fireproofed and colored by treatment with a composition containing fireproofing agent such as NH_4 salts, dye solution or suspension containing size and Na polyphosphate.

167.—Fireproofing.
Walter Herz. Brit. 502,307. *Chem. Abs. 33, 6622* (1939). Fabric is treated with a neutral aqueous solution of borax, NH_4 phosphate and NH_4Cl in approximately equal quantities, containing organic adhesives, preserving or softening agents that have been irradiated with the other ingredients with ultra-violet rays.

168.—Flameproofing Cellulose Materials.
Martin E. Cuprey. U. S. 2,163,085. *Chem. Abs. 33,* 8012 (1939). Materials are impregnated with the reaction product of P_2O_5 with anhydrated liquid NH_3.

169.—Textile Materials: Fireproofing.
V. Virtala. B. P. 500,416. *Chem. Abs. 33,* 6048 (1939). *J. Textile Inst. 30,* A334 (1939). The materials are impregnated with a salt mixture, or its solution or suspension, formed when tricalcium phosphate is treated with sulphuric or hydrochloric acid, together with phosphorus-free neutral compounds of ammonia.

170.—Rendering Materials Less Readily Combustible.
Martin E. Cuprey. U. S. 2,142,115. *Chem. Abs. 33,* 3181 (1939). There is incorporated with the material a suitable proportion of NH_4 sulfamate or other compound of the general formula $(R' — NH — SO_3)_xR$, where R' is H, a hydrocarbon radical or NH_4SO_3, R is a cation of valence X and X is a whole number, the compound having less than 3C atoms for each N atom and having a non-metallic content of at least 48 per cent.

171.—Fireproof Coating.
I. G. Farbenind. Fr. 830,363. *Chem. Abs. 33,* 2624 (1939). The fireproofing composition comprises sugar and a urea-HCHO resin.

172.—Fireproofing Agent.
R. Morin, E. Godet, and A. Lemaire. Fr. 829,309. *Chem. Abs. 33,* 1070 (1939). Sb oxychloride is added to glue used for making plywood, etc., or cloth is impregnated therewith.

173.—Fireproofing.
Richard Almond and Agnes M. Young. Brit. 487,969. *Chem. Abs. 33,* 412 (1939). A mixture for fireproofing cloth comprises $(NH_4)_2SO_4$, NH_4Cl, CH_2O, $MgCO_3$, $ZnSO_4$ and Na phosphate.

174.—Mineral Pigments in the Textile Industry.
P. Colomb. *Teintex 4,* 460-8 (1939). *Chem. Abs. 33,* 8994 (1939). "Sisol" is a mineral pigment used in sizing, dyeing and dulling. Directions are given for making suspensions to which other materials are added for fireproofing, etc.

175.—The Importance of Chlorine in the Rayon Industry and Its Role in the Manufacture of Important Textile Assistants.
Fritz Ohl. *Monatsh. Seide Kunstseide Zellwolle 44,* 148, 150, 152, 154, 156. (1939). *Chem. Abs. 33,* 9658 (1939). A review covering the use of Cl compounds in the manufacture of textile fibers, Cl salts for flameproofing and delustering, etc. 12 references.

176.—The Fireproofing of Fabrics.
Louis Diserens. *Teintex 4,* 671-7 (1939). *Chem. Abs. 34,* 2183 (1940). Discusses the use of NaCl, KCl, $AlBr_3$, AlF_3, $CaSO_4$, $MgSO_4$, $(NH_4)_2SO_4$, $ZnSO_4$, KNO_3, $Ca(NO_3)_2$, Na_3PO_4, K_3PO_4, $Ca_3(PO_4)_2$, $Mg_3(PO_4)_2$, Na_2HPO_4, $(NH_4)_2HPO_4$, $(NH_4)_3PO_4$, $MgNH_4PO_4$, Na_2Co_3, NaZn and Al borates, silicates, $Al(OH)_3$ and Na stannate. Details are furnished for the use of soluble salts formed in the fibers, use of chlorinated rubber, and the use of cellulose esters and synthetic resins.

177.—Fireproofed Textiles: Production.
L. Light. *Textile Weekly, 24,* 714 (1939). *J. Textile Inst. 31,* A92 (1940). A review is given of recent fireproofing recipes recommended for curtains and rayon fabrics. The London County Council recommends either (a) ammonium phosphate 1 lb., ammonium chloride 2 lb., to 1½ gals. water, or (b) borax 10 oz., boric acid 8 oz., to 1 gal. water. In Fr. patent 815,454 the cloth is passed through a 25 per cent solution of zinc phosphate and then exposed to ammonia fumes.

HOME PROCESSES

178.—Fireproofing Fabrics.
Martin Leatherman, U. S. Dept. of Agric. Farmer's Bull. 1786, (1937). *J. Textile Inst. 29,* A350 (1938). The qualities of a desirable fireproofing treatment and the principles of fireproofing are discussed. Methods are suggested for applying solutions in the home, the one recommended consisting of a mixture of 7 oz. borax, 3 oz. boric acid and 2 qts. of hot water.

179.—New Flameproofing Compounds: Sulphamic Acid.
J. Soc. Dyers and Colorists, 54, No. 8, 386 (1938). The ammonium salt of sulphamic acid is a flameproofing agent for textiles which offers advantages over other agents.

180.—Fireproofing of Fabric Can Be Done in the Home.
Science News Letter 33, 155 (1938). Formula recommended by U. S. Dept. of Agriculture is used. This is also protection against the sulphuric acid gas poured into the air by the burning of coal and other sulphur-containing fuels.

181.—Fireproof Fabrics by Simple Home Process.
Scientific American 159, 349 (1938). Same as previous.

GENERAL ARTICLES

182.—Impregnating Fibrous Material.
M. Boucherie. Brit. 165,050. *Chem. Abs. 16,* 650 (1922). A method for rendering materials impregnable, rotproof, fireproof, etc., by use of fatty or oily materials is described.

183.—The Fireproofing or Flameproofing of Textile Fabrics.
M. N. Conklin. *Color Trade J. 11,* 171-3, 259-60 (1922). *Chem. Abs. 17,* 2508 (1923). A list of 31 compounds with the amount of each to render cellulose noninflammable.

184.—Textile Fabric: Fireproofing
I. Ginsberg. *Text. World 65,* 489 (1924). *J. Textile Inst. 15,* A101 (1924). A general article on the principles and methods of fireproofing textile fabrics. The author suggests that the electrolytic method used in waterproofing might be equally advantageous in fireproofing.

185.—Fireproofing of Cotton
Anonymous. *L'Avenir Textile 5,* 39-40 (1923). *J. Textile Inst. 15,* A36 (1924). The paper first deals with the fireproofing of textiles from the historical point of view and then reviews the known methods. Necessary properties required from the fireproofing substance are specified. The method of fireproofing which is stated to give the best results is due to Perkin and involves the use of salts of tin. Recommended process is given.

186.—Waterproofing, Etc., Materials.
Textilberichte 4, 584 (1923). *J. Textile Inst. 15,* A12 (1924). This article comprises accounts of various waterproofing, fireproofing, etc., methods. Details of "Special Solutions," Temperatures, etc., are given.

187.—Fireproof Cloth, History of.
Nature, 116, 415 (1925). *J. Textile Inst. 16,* A350 (1925). Under the heading "Early Science at Oxford" appears the note, "Sept. 16, 1684; Merchant Wayts' account of his piece of Incombustible Cloth was read."

188.—Fireproofing: A New Fire Preventive Treatment.
R. A. Kolliker. *Papier-fabr. 23,* 162-4

(1925). *Chem. Abst. 19,* 3017 (1925). *J. Textile Inst. 17,* A57 (1926). The "Cellon" fire preventive treatment for fibrous material is described. Cellon is a liquid, is non-toxic, odourless, water-soluble, and does not alter the physical properties.

189.—Fireproofing.
Winter. *Chem. Zentr. 2,* 1599 (1926). *J. Textile Inst. 17,* A414 (1926). A summary of the patent literature relating to the preparation of non-inflammable materials of all kinds.

190.—The Manufacture of Fireproof Coating Material.
Anon. *Farbe und Lack* 456 (1926). *Chem. Abs. 21,* 182 (1927). Formulas are given.

191.—Fireproofing Articles.
Willy Arndt. *Kunstoffe. 18,* 245-7, 281-4 (1928). *Chem. Abs. 24,* 3090 (1930). A number of compositions adapted to impart fire resisting properties to materials impregnated therewith are listed. The range of components which have long been known is large.

192.—Fireproofing of Fabrics.
J. E. Ramsbottom and A. W. Snoad. Dept. Sci. Ind. Research 2nd. Rept. Fabrics Coordinating Research Comm. 16-93 (1930). *Chem. Abs. 24,* 3376 (1930). *J. Textile Inst. 21,* A506 (1930). Various inorganic salts were impregnated on cotton fibers and their comparative fireproofing effectiveness established from the minimum quantity of the salt required to prevent flame propagation. A large number of inorganic compounds are classified. Alkalies, acids, or compounds yielding them upon gentle heating and easily reducible oxides and oxidizing agents were found to be effective fireproofers. The results indicate that chemical action between the impregnating substance and treated fabric plays an important part in fireproofing, though other factors are probably of importance. Many of the possible fireproofing agents injured the physical characteristics of cotton seriously upon aging. A binary mixture of 3 parts boric acid to 7 parts borax applied to cotton fabric to the extent of 6 per cent was found efficient from the standpoint of fireproofing and inertness toward the fibers.

193.—Fabric Proofing.
C. O. Clark. *Textile Weekly 4,* 696, 700 (1930). *Chem. Abs. 24,* 3375 (1930). A general description is given of the modern methods and materials used in the 3 processes, flameproofing, waterproofing and mothproofing.

194.—Woolen Fabrics: Fireproofing.
Wool Rec. 40, 559 and 566 (1931). *J. Textile Inst. 23,* A196 (1932). The following methods of fireproofing are discussed: impregnation of the material with a salt which leaves on ignition a good deal of ash; the use of a salt which at a comparatively low temperature fuses or is converted into a fusible body; the employment of a substance which, on heating, gives off gases which are not supporters of combustion. The use of mixtures is also discussed, and the production of goods which are fireproof after wetting out or washing.

195.—Flame Protectives for Rayon.
Karl Micksch. *Kunstseide 14,* 64-6 (1932). *Chem. Abs. 26,* 2869 (1932). *J. Textile Inst. 23,* A196 (1932). A review of the subject including a description of incidents in the use of fire-retarding agents and a discussion from a forensic standpoint.

196.—Fireproofing Agents: Application.
H. Stadlinger. *Synthetic Application Finishes 3,* 91-4, 102 (1933). *J. Textile Inst. 24,* A319 (1933). *Asphalt Teer Strassenbautech. 32,* 520-3 (1932). *Chem. Abs. 26,* 5390 (1932). The use of various chemical agents and their objectionable features are discussed briefly in describing the Eichengrun "Cellon" treatment. Tests for fireproofing action are described for this and 2 I.G.F. agents, "Intramon" and "Locron H."

197.—Flameproofing of Textiles.
R. Chesneau. *Bull. Soc. Ind. Rouen 60,* 265-275 (1932). (*T. I. 24,* A211, 1933). *The Dyer. 69,* No. 7, 357; No. 8, 393-4 (1933). *J. Textile Inst. 24,* A372 (1933). *Textile Colorist 55,* 375-7 (1933). *Chem. Abs. 27,* 3827 (1933). A review of methods of fireproofing and materials used, including $(NH_4)2SO_4$, NH_4 phosphate, NH_4Cl, Na tungstate, borax, $MgCl_2$, mixtures containing asbestos, and cellulose lacquers.

198.—Fabrics: Fireproofing.
L. P. Michel. *Tiba 12,* 3-5 (1934). *J. Textile Inst. 25,* A188 (1934). Permanent fireproofing of fabrics may be effected by precipitating suitable insoluble materials in the textile fibers, or by applying finishes which incorporate insoluble fireproofing compounds. The second method gives better fixation but has a greater influence on the flexibility and handle of the goods.

199.—Non-inflammable Rayon Yarns.
H. Roche. *Textile Mfr. 61,* 31-35 (1935). *Chem. Abs. 29,* 4936 (1935). Various methods are described.

200.—Fireproofed Textiles.
W. F. Brosman. *Textile World 84,* 2399-2400 (1934). *J. Textile Inst. 26,* A203 (1935). *Chem. Abs. 29,* 1256 (1935). A table shows approximately the minimum percentages by various weight of various compounds required to flameproof cotton. The presence of compounds of Fe, Cr. Pb and Cu appears to accelerate the rate of burning. Mixtures of NH_4 salts, borax and boric acid are efficient and inexpensive; the NH salts are sources of inert gases, and the B. compounds of fused vitreous coatings. The Perkin process for "permanent" treatment is described.

201.—Fireproofing and Fireproofing Agents.
Am. Matagrin. *Rev. Chim. Ind. 44,* 74-8, 105-12, 126-37 (1935). *Chem. Abs. 29,* 5542 (1935). A general discussion and review of methods of fireproofing, of fireproofing agents, and of the methods of utilization of fireproofing agents and fireproofed materials.

202.—Fire-resistant and Water-resistant Impregnation Treatments.
St. Reiner. *Gelatine, Leim, Klebstoffe 2,* 271-5 (1934). *Chem. Abs. 29* (1935). Treatments to impart a degree of fire resistance to fabric or fibrous materials are classified according to the means by which combustion is retarded: (1) impregnation with materials, such as Na silicate, that mechanically exclude O from the combustible material, (2) impregnation with compounds that evolve non-inflammable gases, (3) the use of difficultly combustible materials, and (4) miscellaneous.

203.—Proofing of Textiles Against Water and Flame.
Andrew J. Kelly. *Cotton 98,* 53-6 (1934); *99,* 41-3 (1935). *Chem. Abs. 29,* 1646 (1935). Flameproofing and attempts at double proofing against water and flame are given attention.

204.—Effect of Fireproofing Agents on Rayon Fibers.
V. Henk. *Kunstseide 18,* 45-6 (1936). *Chem. Abs. 30,* 2393 (1936). The fireproofing materials which damage the fiber are named and the type of damage noted. Those which do not damage the fiber are named and discussed.

205.—The Impregnation of Textile Fabrics.
Rud. Taubitz. *Wollen-und Leinen—Ind. 57,* 74-5, 107-8, 142-4, 157-8, 174 (1937). *Chem. Abs. 31,* 7654 (1937). A review of methods of impregnating textiles to render them resistant to moisture, fire and bacterial action.

206.—Methods of Analysis.
Rulolf Monch. *Deut. Wollen-Gewerbe. 71,* 308-12, 347-50, 379-82, 412-21 (1939). *Chem. Abs. 33,* 7575 (1939). A discussion of the analysis of water, etc., impregnating agents used to render the textile resistant to water and fire, etc.

207.—The Impregnation of Staple Rayon and Rayon.
Karl Micksch. *Kunstseide. 5,* 118-20, 162-4 (1939). *Chem. Abs. 33,* 9655 (1939). Suggestions and various recipes are given for water- and flameproofing impregnations.

208.—Fire-resisting Impregnations.
Freitag. Monastschr. *Textil. Ind. 53, Fachheft 3,* 69-70 (1938). *Chem. Abs. 33,* 2611 (1939). A review of the fireproofing of fabrics, wood, card board, paper, etc.

Twentieth

ANNUAL MEETING AND CONVENTION

OCTOBER 18TH AND 19TH, 1940

HOTEL COMMODORE

NEW YORK CITY

OCTOBER 20TH, AT N.Y. WORLD'S FAIR

General Chairman

PATRICK J. KENNEDY

TECHNICAL PROGRAM

DR. WALTER M. SCOTT, chairman of the Technical Program Committee, is introducing a number of novel features. Among them are two symposiums as follows:—

"Evaluation of the Properties of Finished Textiles"

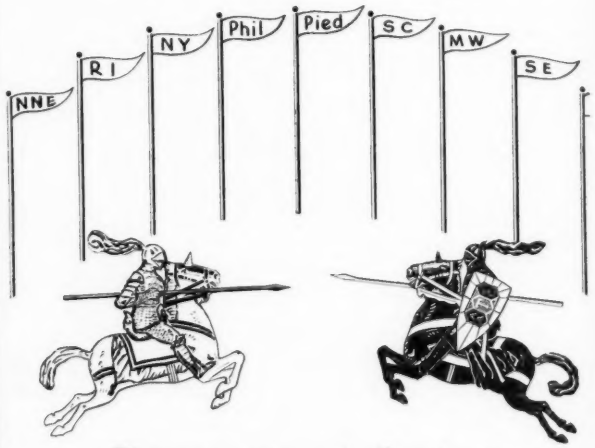
and

"Chemical Aids for the Textile Industry."

Experts will be on hand to lead the discussions and to answer questions from the floor. These timely subjects should prove of the greatest interest.

Auspices of

NEW YORK SECTION



Intersectional Contest

Titles of papers to be presented by various sections are as follows:

New York Section — "Informative Textile Labeling."

Northern New England—"What is New in New England."

Rhode Island—"The Effect of Modern Finishing Agents on the Light Fastness of Cotton Colors."

Philadelphia — "Variables Encountered in Fadeometer Testing."

Piedmont—"Screen Printing in the South."

Southeastern — "Some Observations on the Tendering of Vat and Naphthol Dyed Army Duck on Total Exposure to Weathering."

AMERICAN
DYESTUFF
REPORTER

A. P. HOWES
Publisher

LOUIS A. OLNEY, Sc.D.
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MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

Subscription price: $5.00 per year. Canadian, $6.00; foreign, $6.00.

Vol. 29 September 2, 1940 No. 18

RESEARCH AND PROSPERITY

THOSE industries in which research has long been standard practice and has been extended to such a degree that tradition no longer plays an important part, have a way of prospering and paying high wages to labor. On the other hand, those industries in which the value of industrial research has not been recognized to such a degree, where traditions still play an important part, are likely to be less prosperous and to pay low wages. In other words, everybody gains from research. Even the consumers usually gain for the reason that selling prices are reduced.

Such facts as these indicate why the metal and allied industries have grown and prospered to the degree they have during the past fifty years, why the wage rates paid are in the upper brackets for labor, why metals have displaced other materials to the degree they have. It was back in 1881 that Frederick Winslow Taylor started the scientific management movement and also serious industrial research in the metal fields.

Taylor believed in approaching management problems with a scientific mind. His study of labor and management problems led him in the direction of improving tools and machines. So, in 1898 in co-operation with Maunsel White he perfected a tool steel tempering system which increased the speed of removing metal in machining. From his time on to the present, research in the metal field has progressed and expanded. It has resulted in new processes, in more and more alloys, in lowering costs of products, in replacing with metal other materials which were more satisfactory before metallurgy found an alloy which met the requirements better.

Without this research, the automobile industry could not have reached its present proportions. Cars could not be sold for as low prices as they are and probably could not be as well made. The airplane industry could not have gone ahead by the leaps and bounds that it has. As a matter of fact, this movement which Taylor started back in the 1880's has not only made the old metal industries more and more prosperous but has been instrumental in making more and more new industries possible. Obviously, it has been these new industries which have enriched the old ones.

In the non-metal fields, things have not gone as well. The textile industry has not been noted as a high wage industry. The woodworking industry has tended to lose ground. The farmers complain about how difficult it is to make a living. In all fields where metal does not enter into the finished product, there has been a tendency to look upon the dark side rather than the bright.

Non-metal research, however, has been increasing since 1920. It is making new industries possible. The rayon industry is one. The nylon industry is on the way. Plastics are already making inroads into the fields recently held by metal. The combination of plastics and wood give promise of producing an engineering product in which wood plays a large part but which is superior in many ways to the lumber to which we have been accustomed in the past. To just what degree the farmer will be affected remains to be seen. Work in the field of cotton seed, however, has already brought about decided improvements, made cotton seed a more valuable product than formerly. Continued research is likely to create new demands for what the farmer raises. A substitute for wool is already being produced in Europe with cow's milk as the raw material.

The point of all this is that, if industrial research is carried on to a much greater degree in one field of industry than it is in another, that field in which it is carried on to the greatest degree gains and that in which it is conducted least loses. The losses may be disastrous.

The point had about been reached where the metal industries could not continue their growth and prosperity to the degree they have during the past fifty years unless other industries began to catch up. With other industries only moderately prosperous and not in a position to pay the high wages of the metal industries, buying power of the people was too limited.

All of the laws which have been passed during the past ten year to make people prosperous and to increase their buying power do not seem to have succeeded to the degree desired. Every increase in the knowledge which leads to the practical application to our industries of scientific laws, however, does increase our prosperity, does raise our buying power, does give more employment at wages which have a greater buying power than previous wages did.

There is an inter-relation of industries which makes it necessary for all to prosper if a few are to continue to prosper. Those things which are produced in one industry have to be sold to those who make their livings in other industries. The market for textiles has been greater because of the prosperity in the metal industries. The automobile industry, however, has not sold as many new cars each year as it would have sold, had wages been higher than they have been in the textile industry, had more farmers been making good profits, had coal miners all been able to buy new rather than used ones.

Up to 1920 our new industries were closely allied to the metal industries. There was the telephone industry, the electric power industry, the electrical manufacturing industry, the automobile industry and the beginnings of the airplane industry.

Since 1920 the new industries have been in other fields. The rayon and nylon are two examples. The radio industry is using plastics to a marked degree and surprisingly little metal. We are already preparing the way for more and more entirely new industries entirely outside of the metal industries. These industries would not have been possible had it not been for the research that has been conducted for the past twenty years. If the progress seems slow in comparison to what has been accomplished in the metal industries, it has been due primarily to the fact that serious industrial research was started so much sooner in those industries.

In the future we may expect a much better balanced prosperity than we have known in the past. This balance will be due to the fact that there is a better balance in research work. More and more users will be found for non-metals, for textiles, farm products and all other non-metals. As more and more scientific laws are given practical application, returns to investors, management and labor may be expected to increase.

As our industrial research becomes better and better balanced, we will depend less and less on any other nation. The time should come when we need not depend on any other. When that is the case, there will be less excuse for us fighting other people's wars and the prospect of long periods of peace will be much greater.

Research in all the metal and allied fields is now so thoroughly established, there is no need to worry about the future of those industries. Research in all other fields is of much later origin. It is not yet as intensive and extensive. Yet, the non-metal field is a larger one than the metal field. There are more problems to solve. There are more industries which need the help which only research can give and which need it badly.

Prosperity depends upon producing more at less man hour cost. It depends upon producing entirely new products. There is a limit to the number of present products which people can use. The average man has need of but one automobile. The number of radios he will buy is limited. Place something entirely new upon the market, something as new as radio was twenty years ago and he will buy that.

Industrial research, the work that has been carried on in the metal fields, has shown the way to the lowest production costs. The real problem is to find work for those who are not needed in the older industries. That means perfecting and producing new products. Research workers have to find these new products.

Most of our new industries which depend largely upon metals are new only because those products could not be produced satisfactorily before the days of metallurgy. The idea of the airplane is hundreds of years old. Automobiles were actually made more than a hundred years ago. It required a lot of research in the field of metals to make the electrical and the telephone industries what they are. Ideas which were comparatively old could be put to practical use as the knowledge of metals increased.

In the non-metal field, the same is bound to hold true. As industrial research continues, problems which have never been solved will be solved. New products will be developed and new industries will be started but, more important than all else, all industries can expect to prosper to a degree they never have before.

If there is a lower third or two-thirds or our population who have never enjoyed the standard of living to which they are entitled, it has not been the fault of our economic system, of our form of government, of hard hearted employers or of anything else other than the fact that not sufficient industrial research has been conducted in those industries in which these people are normally employed. Politics, alone, never has, never can, give us prosperity. Industrial research has made, is making and will make us more prosperous.

THIRTY-THREE YEARS' EXPERIENCE IN RAW STOCK AND PACKAGE DYEING

ANDREW FISHER

I NEVER think of package dyeing without thinking of John Hebden who was my first boss just thirty-three years ago this summer. John had an excellent mechanical and chemical training and was a born scientist. He used to give me an hour's lecture every morning on how dumb the Germans were and how they stole most of their ideas from the Scotch. This was in addition to an excellent lecture on dyestuffs. John knew the dyestuff business from the ground up. He had made, used, bought and sold dyestuffs and chemicals for about forty years and he was spending a lot of time and money developing a package dyeing machine in Klipstein's old warehouse on Mattieson St. in Providence, R. I.

Klipstein had taken the agency for the Kohnen dyeing machine and John was trying to get some production out of the thing. The way the Germans made it was far from satisfactory. The first thing John wanted to do was to dye yarn on little paper cops. He stuffed the machine with raw cotton and had the cops packed in with it. The idea was to have the raw stock spun into warp yarn and the cops would go right on the filling bobbins.

We found out a lot of things about the size of the holes in the cover of the boxes. The Germans thought the pressure had to be high in order to penetrate the cops but we found out they were wrong. Low pressure and fast circulation through bigger holes in the cover was the answer but John wasn't satisfied. He kept right on trying and continued his work up at Franklin, New Hampshire, where he had the benefit of Sulloway's master mechanic who evolved the first successful Franklin spring which should be called the Daniels' spring. Mr. Daniels was the master mechanic at Sulloway's who really put the idea over.

About a year later I arrived at Amoskeag as assistant to W. K. Robbins. who was working on the Chattanooga machine in a big way. They found they could dye raw stock in the Chattanooga machine in 1200 lb. lots for about ¼ cent a lb. labor cost including the drying. By making the holes in the cover 1½ inches in diameter we cut the pressure down to about 12 lbs. to the sq. inch and circulated the 700 gallons in about two minutes. With small holes in the cover the machines were almost useless for us because the top third of the cotton in the middle of the batch was almost white and the pressure went way up. This was very dangerous, other plants had blown off the covers, killing some operatives and scalding others. With the holes, low pressure and quick circulation, any trouble was a thing of the past.

Now sometimes I see these dyeing machines and they still have little holes in the cover and slow circulation and I doubt the truth of the saying "How Time Flies." High paid executives still believe the Germans were right about high pressure and in spite of the fact, they are successful. Amoskeag passed on but not because Sam Mungall and W. K. Robbins didn't know how to dye fast colors on raw cotton.

One of the reasons why the Abbott system of top dyeing is successful is because of the low pressure and the relatively large sized holes in the jack spool. The layer of top which is wound in the jack spool is not thick enough to cause any pressure to speak of. In dyeing yarn on packages the pressure is higher but it must not be so high as to cause channeling. High pressure on the mass to be dyed forces the dye liquor to find the path of least resistance instead of being evenly distributed throughout the mass of the cotton. Thus, we see that there must not be a great difference in the pressure between the outside and the inside of the mass of yarn whether it be wound on a spring or on a perforated tube. The larger the inside diameter of the package the better. This tends to equalize the pressure and is a favorable factor, causing even distribution and less liability to channel. This has been the chief reason for success in beam dyeing which is now quite successful in many large plants.

• TECHNICAL NOTES • FROM FOREIGN SOURCES

Dyeing of Soaps

Dr. W. Richter—Fette u. Seifen, 47-61, *February,* 1940.—For coloring soaps, water soluble, alkali-fast dyes of the acid aniline group are generally employed. These are most safely bought from dealers specializing in such products who can supply full instructions for their application, as well as offering a wide choice of dyes in all desired shades. The use of these water soluble soap dyes is quite simple. They are dissolved in hot water, strained through a cloth, and when well combined added directly to the soap-mass. 100 gr. of dyestuff may be dissolved in three to four liters of hot water. Straining through a cloth is for the purpose of removing any undissolved dye particles, as otherwise these might injure the appearance of the soap by causing color specks. Special additions, such as soda or spirits, are made in dissolving certain colors. Only glass, earthen or enamelled vessels should be used, as metal containers, under certain conditions, tend to reduce dissolved aniline dyes, and may so cause loss of color.

Dyeing results are influenced by various circumstances. Much depends upon the nature of the soap itself, as a naturally dark material can never give us bright and attractive effects as one that is clear to begin with. It should be kept in mind that aniline colors, unlike the insoluble pigments, have little covering power, and that no dark material can be dyed a bright shade with these dyes. A proper consistency of the soap material is also important, especially in the production of clear and delicate tints such as elderblossom, salmon red or uranium yellow. If through improper consistency the soap dyes poorly, the blame is often quite wrongly attributed to the dyes employed.

Other causes than the common one of color specks may lead to unsatisfactory dyeing results. If too highly concentrated solutions of dyestuff are used there may be separation or crystallization of dyestuff in the soap-mess. Imperfect saponification or presence of excessive alkali may also be responsible. Traces of metal, especially of copper or iron, can prove extremely harmful through catalytic action. Under certain conditions the use of improper perfumes or essences may produce poor results, and even the fats and oils used, if they contain residual traces of bleaching material employed in their clarification, may exert an unfavorable influence on the dyeing.

The modern demand is usually for soaps in clear and soft colors, a fact which serves as the best guarantee against the danger of dye transferring from the soap to fabrics

being washed—a result which can hardly be avoided when using soaps dyed in heavy shades such as brown, dark green or black. Soaps dyed in delicate tints with water soluble colors should not be subjected in show-windows to the direct action of sunlight, as the small amount of dye present cannot long withstand such exposure.

In addition to the water soluble soap dyes, the insoluble pigment colors are also employed. These pigments, which are distinguished by their fastness to light, are added in the form of water pastes, and are thoroughly stirred into the soap in the mixing machine. For the sake of completeness the oil soluble soap dyes should also be mentioned. These are dissolved with long stirring, 10-20 gr. of dye to a liter, in oil which has been previously warmed on the water bath. In actual practice this method of dyeing is not of great importance.

An Accelerated Light Fastness Test in Use at the Shirley Institute

H. Hunter—J. Soc. Dyers and Col., 56-64, *February,* 1940).—One of the major resistances demanded of dyed fabrics is that of fastness to light. So successfully has this requirement been met that laboratory testing of great stringency has now become necessary, and it was to meet such a demand that the light fastness test here described was developed. It was desired to subject dyed samples to irridation equivalent, as nearly as possible, in quality and quantity to sunshine amounting to at least 2,000 hours, in as brief a test period as could reasonably be achieved.

The quality of the sun's radiation is about that of a black body at a temperature of 6,000° C. absolute. At noon of a fine summer day in temperate latitudes the intensity of sunlight falling on a surface normal to the rays at the surface of the earth is approximately 10,000 foot candles. The problem is therefore to obtain a surface illuminated by artificially produced radiation at a color temperature as near 6,000° K. as possible, and with an intensity preferably not less than 10,000 foot candles.

The light emitted by the sun is much bluer than that received at the surface of the earth. As the sun's rays pass through the earth's atmosphere some of the blue and ultra-violet rays are absorbed and more are scattered, so that the "daylight" to which dyed fabrics are exposed in service is thus a variable mixture of direct sunlight, which may be fairly represented as a black-body radiation at 6,000° K., and blue sky light, which somewhat intensifies the blue and ultra-violet end of the spectrum. Quality and intensity of "daylight" are of course influenced by the great variability of atmospheric conditions, but at noon on a fine summer's day in temperate latitudes it may be taken to consist of approximately 80-90 per cent sunlight and 10-20 per cent sky light.

Artificial light sources may be broadly divided into two classes—those that emit black-body radiation (with conitnuous spectra) and those that emit selective radiation (with discontinuous spectra). In the first class fall most common flames used for illumination, electric filament lamps and carbon arc lamps. In the second class are vapor discharge lamps and metallic arcs. In no case in practice is true black-body radiation emitted by any light source, but for present purposes this classification is sufficiently accurate. Sources emitting only selective radiations are unsuitable for light fastness testing purposes, and are not considered further.

The highest temperature that can be maintained in practice is about 4,000° K., the temperature of the positive crater of the plain carbon arc and the boiling point of carbon. This arc emits radiation which, though not identical with daylight quality, is still sufficiently close to make it serviceable for testing light fastness of dyed textiles. Electric filament lamps are not really suitable for such testing, because they are not hot enough. An electrically heated filament at 3,000° K., which is about the highest practically attainable temperature, emits radiation that is much too red, and too deficient in blue and violet, to match sunlight.

Demands for a hotter light source than the carbon arc have been met by evolution of the "high intensity" type of carbon arc, in which the light source is not a white hot solid, but an incandescent vapor held by the electron pressure of a heavy electric current within a deep crater of the positive carbon. This carbon is cored with a mixture rich in rare earth salts, chiefly cerium fluoride, which is softer than the carbon casing and burns away more rapidly, thus producing the crater within which the rare earth salts are liberated and retained for a short time in an incandescent state. The hot vapor is maintained at a temperature about 1,000° C. above the boiling point of carbon. The light emitted by this type of arc approaches more closely to sunlight quality than does the light of the ordinary carbon arc. The latter reaches a constant brightness of about 170 candle power per sq. mm., while the high intensity crater may have a brightness of from 400 to 900 candle power per sq. cm., according to the current density employed.

Since the high intensity arc functions properly only when the carbon electrodes are inclined, some form of projection test lamp is obviously indicated. That in present use at the Shirley Institute (British Cotton Industry Research Association) is a Stelmar cinema projector, consuming 65 amperes at 40 volts, with the arc situated just outside the focus of a chromium plated twin parabolic mirror of 8½ in. aperture. A glass lens, 3 in. in diameter, is mounted on the axis of the projector system, 5 in. from the arc crater. This optical system concentrates light on to the target at a distance of 30 in. from the arc. The mean intensity of light on the samples is about 200,000 foot candles, or twenty times that of noon summer sunlight.

The great intensity of radiation involves considerable heating of the samples. A cooling system is maintained by directing on to the samples a blast of air which approximates 250 cu. ft. per minute. This reduces temperature rise on even the darkest samples to less than 20° C. The air is freed from dirt and dust by passage through two

large bags of cotton velour. The system employed in classifying dyed samples for light fastness is based upon that of the U. S. Bureau of Standards.

The high intensity arc, when its light has been passed through glass to remove the short wave ultra-violet radiations, gives light which in quality very closely resembles daylight, and in intensity may be made to exceed that of noon summer sunlight twenty fold. This equipment can test 16 dyeings (32 exposed samples) of the highest commercial light fastness in a week of 5 days at 6 hours per day, whereas a plain carbon arc working day and night for five days a week, requires about 4 weeks for the same purpose, while the exposure to daylight would be more than one year.

The initial cost of this method is not too great but the running costs are very much higher. It is considered, however, that its speed and accuracy justify the maintenance of at least one equipment of its kind at a central English testing station.

Nylon—

(Concluded from page 440)

SUMMARY

1. In undyed fiber mixtures nylon is most readily distinguished by dyeing with neocarmine.

2. Chemically nylon is best distinguishable from

a. Cotton, by the solubility of nylon in hot concentrated acetic acid.

b. Silk, by the insolubility of nylon in calcium thiocyanate, sp. gr. 1.20-1.21 at 70° C.

c. Wool, by the insolubility of nylon in boiling 5 per cent potassium hydroxide.

d. Cellulose acetate, by the insolubility of nylon in acetone.

e. Regenerated celluloses, by the insolubility of nylon in calcium thiocyanate of sp. gr. 1.36 at 70° C.

3. The use of calcium thiocyanate, sp. gr. 1.20-1.21 at 70° C., to remove silk in the analysis of a silk-nylon mixture is satisfactory.

4. The use of boiling 5 per cent potassium hydroxide to remove wool in the analysis of a wool-nylon mixture gives accurate results.

5. The analysis for nylon in cotton-nylon mixtures by the solution of nylon in boiling 80 per cent acetic acid gives satisfactory results.

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TRADE NOTES • NEW PRODUCTS

• SOAP SUBSTITUTE

A new soap substitute based on a scientific formula which is said to give it "extra strength" and "plus power" for tackling difficult spots has just been put on the market by the Warwick Chemical Co., West Warwick, R. I., for use in scouring, boiling off, dyeing of piece goods, raw stock, hosiery, silk or rayon, cotton or wool.

This new detergent, known as Sulfanole K is claimed to be far more effective than soap because of its thorough wetting and penetrating properties; and more economical because only half the amount of Sulfonole K is required to do the same work that soap would do. Moreover, Sulfanole K is said to rinse with terrific speed.

Another feature of this new WARCO detergent is said to be its immunity to hard water, alkali or acids which therefore prevents the forming of line soap and similar problems usually encountered.

Like all Warco Sulfanole Detergents, Sulfanole K is designed to tackle a specific plant problem. As a special service Warwick technicians are available for advice on formulae for individual needs.

• CIBA REVIEW

Ciba Review, Number 34, for June, 1940, concerns itself with the subject, 'The Development of Footwear." Contents are described by the following titles: Primitive Forms of Footwear; Footwear of the Ancient Orient; Footwear in Greece and Rome; The Development of European Footwear from the Fall of Rome to the Renaissance; Shoe Fashions of the 17th and 18th Centuries; The Transition from Hand Made to Machine Made Footwear; Historical Gleanings. The subject matter is profusely illustrated.

• FOLDER ON SYNTHETIC ALCOHOLS

Carbide and Carbon Chemicals Corporation, Unit of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York, N. Y., announces the publication of a new folder entitled "Synthetic Alcohols." The folder is one of a series of pamphlets designed to present brief and concise information on industrial organic chemical families. This latest one describes 12 members of the alcohol group—from methanol to heptadecanol—giving the uses of each. A convenient table presents their principal properties—boiling points, specific gravities, vapor pressures, flash points, and various solubility data.

Industry considers the alcohols one of the most important groups of organic chemicals. The lower alcohols are well known as anti-freeze compounds, solvents, germicides, and antiseptics; the higher alcohols are used as general extractants, anti-foaming and flotation agents, and chemical intermediates, while their sulfate salts are said to be excellent wetting, emulsifying, and cleansing agents. Alcohols are characterized by their ability to take part in reactions forming esters, ethers, amines, aldehydes, and acetals, and therefore are useful in the manufacture of many other products including dyestuffs, cleaners, polishers, lacquers, varnishes, soaps, pharmaceuticals and perfumes.

• GENERAL RELEASES

General Dyestuff Corp., 435 Hudson Street,, announces release of circulars on the following products:

Cyclopon A—a novel scouring agent said to possess excellent stability to hard water,

acids and alkali. It is stated that it can be offered for all scouring purposes for animal or vegetable fibers, wherever economy is desired. As a scouring agent it resembles Igepon T and only lacks its versatility as an emulsifying, wetting and dyeing assistant. Circular G-194.

Phenamine Blue Black B C W—A direct color which produces deep blue black shades on cotton and rayon. The outstanding feature of this product is said to be that, in the dyeing of mixed fibers, acetate rayon is left practically unstained. Circular G-190.

Rapidogen Brown G N—has been on the market for some time and is said to have met with a favorable reception by printers. It is dissolved, printed and developed in the usual manner for Rapidogens. On fabrics of cotton or rayon it is said to produce neutral browns of good fastness to soaping and chlorine, but is only moderately fast to light. Circular G-184.

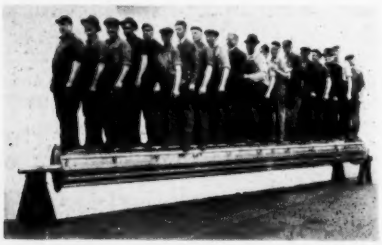
Celliton Fast Purple D—a dispersed direct dyeing acetate dyestuff which, it is claimed, produces bright violet shades of a bluish cast on acetate rayon.

Celliton Fast Purple D is said to be distinguished by its very good to excellent fastness to light. In its other properties it substantially corresponds to other Celliton colors, having good all around fastness properties.

While viscose and cotton are slightly stained, such stains can easily be removed by an aftertreatment with Blankit I or a mild bleach with permanganate and sodium bisulfite. It, therefore, is suitable for dyeing mixed fabrics where viscose or cotton must be left clean.

• RODNEY HUNT STAINLESS REEL

These 19 stalwarts made a striking test of a new patented construction for stainless steel reels developed by the Rodney Hunt Machine Company of Orange, Mass.



The 19 men climbed aboard the reel, which was suspended by the ends of the shafts. Their dead weight produced no perceptible bending. Rodney Hunt calls this a "pipe body" construction and claims that this reel illustrates the type of construction that makes possible reels up to 30 feet in length.

• NEW SCOURING AND CLEANSING AGENTS

The Aldox Laboratories Inc., 54 Charles Street, Boston, Mass., have recently placed upon the market two products known as Aldox L and R.

These products are recommended by the manufacturers for the scouring of all textile fibers and consequently are said to be of especial value in the cleansing of fabrics in which there are combinations of animal fibers with cotton and the various synthetic fibers. These products are also recommended as being extremely effective detergents for the removal of spinning and throwing oil from all classes of yarn and cloth and in the washing and clearing of textile prints. Aldox L slowly liberates oxygen during the process of application and develops a pH of less than ten. Aldox R on the other hand may be used in combination with alkalies for the maintenance of a higher pH.

• SOLVAY SALES FOLDER

A new folder on calcium chloride for drying air and ending condensation in basement game rooms, clothes closets, photo dark rooms, bank vaults and similar places has just been announced by the Solvay Sales Corporation.

Progressive photos show how calcium chloride absorbs moisture from the air, thus protecting furniture, pictures, records, tools, and equipment from the mold, mildew and warping associated with excessively humid air. Also covered are: what calcium chloride is—how to use—where to use—quantity required. A simple container for exposing calcium chloride to the air is described and illustrated, and the literature also contains "tips" covering the use of calcium chloride with this container.

Free copies of this literature may be obtained by writing to Solvay Sales Corporation, 40 Rector St., New York, N. Y., and asking for folder captioned "To Dry Air."

• MIXING TANK

One of the recent pieces of equipment fabricated from Jessop Silver-Ply stainless-clad steel is a mixing tank built by L. O. Koven & Bros., Inc., Jersey City, N. J. It can be used for mixing liquids with other liquids; or with dry or semi-wet solids to produce syrups, emulsions, creams or pastes.

Walls of the tank were made from Type 306 Silver-Ply plates manufactured by the Jessop Steel Co., 501 Green Street, Washington, Pa. These particular plates consist of .086 in. of stainless steel cladding inseparably united to .351 in. of mild steel backing; however, Silver-Ply sheets and plates are supplied in practically any degree of cladding desired.

Silver-Ply was specified for the new mixing tank because the stainless cladding (on inside of tank) is said to provide the same permanent protection from contamination as solid stainless, while the mild steel backing lessened material costs and made fabrication easier. The tank can be jacketed to heat or cool its contents during mixing, and the superior heat conductivity of Silver-Ply was found desirable should this be necessary.

Complete information on Silver-Ply stainless-clad steel for use in processing equipment may be obtained from the Jessop Steel Company.

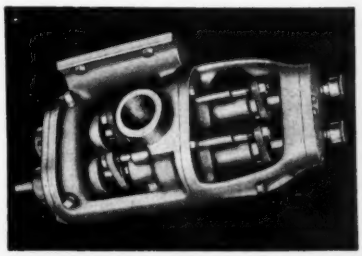
• WATSON-PARK ANNOUNCES

H. Raymond Wilkinson, who has been engaged for the past five years as superintendent of dyeing and finishing at Harris, Emery Company, Penacook, N. H., has joined the technical staff of Watson-Park Company as a trouble shooter and consultant.

Wilkinson is thoroughly familiar with all phases of dyeing and finishing of woolens and worsteds and his services will be available early in September.

• NEW ACID PUMP

Designed and built to handle acids and liquids, whether thin or viscous, this new pump, it is claimed, is especially adaptable to the textile industry. In its action it is said to be positive and slow speed and will operate under pressures and vacuums, and also set as metering pump for mixing solutions. Made in sizes to meet plant requirements. It can be quickly and easily cleaned and is said to be economical in its operation.



The Bump Pump is made by the Bump Pump Co., La Crosse, Wis.

• NEW MONSANTO PLANT

Monsanto Chemical Company has begun work on engineering plans preparatory to construction in the Detroit industrial area of a manufacturing plant for the production of peacetime chemicals required by other American industries in the making of products for domestic consumption, Edgar M. Queeny, president, announced recently at Monsanto headquarters in

St. Louis, Mo. The plant will be Monsantos eighteenth and the fourth in the Phosphate division of the company.

It will be known as the Trenton plant and will produce phosphoric acid and phosphates, the major users of which are the automotive, steel, textile, soap, food products and baking industries.

Decision to locate the plant in the Great Lakes industrial area near Detroit was made by the Monsanto management, Mr. Queeny said, after a three-year study of engineering involving the availability of necessary raw materials, freight transportation costs on the materials and closeness to consuming industries. Consideration of the new plant began long before the outbreak of the European conflict, Mr. Queeny said, and it is significant that all of the chemicals to be manufactured are peacetime products and are essential in the manufacture of other products by industries serving domestic consumers almost exclusively.

Mr. Queeny said:

"Among the most important of the products we will manufacture in this new Michigan plant are the various forms of disodium phosphate, trisodium phosphate, and tetrasodium pyrophosphate.

"These sodium salts of phosphoric acids are only a few of the discovered compounds of this prolific material but in them is a world of peacetime products. The textile industry for one uses some of these for scouring, kier boiling, dyeing and soaping off after dyeing. Others are employed as water softeners, detergents and metal cleansers. Industrial cleansers, such as those used to clean oil and grease from metal are made more effective with the addition of sodium phosphates.

"The soap industry uses large quantities of these phosphates as a builder for household and laundry soaps. Other uses are emulsification of cheese, weighting silk, dishwashing compounds, treating of boiler water, medicines, dentifrices and leavening agents."

The new plant, Mr. Queeny said, will go into operation in mid-1941.

• SPECIAL EXACT WEIGHT SCALE

This Model No. 8003-DH scale, for use in dye houses and bleacheries, is, according to the manufacturer, especially adapted to give positive control in developing formula, matching and mixing colors.

The scale weighs correctly in an ordinary out-of-level position, making it unnecessary to rebalance the scale when moving it from one position to another.

Visible weight control is provided by means of indicator movement of 1 inch for 1 ounce.

The scale is built to stand the corrosive action of dyes and chemicals. The housing is finished in porcelain enamel, either white or Nile blue. Working parts are made of non-corrosive metals or are given special non-corrosive treatment.

Dial is 2 ounces and under by one-quarter ounce graduations.

Two beams, both on the front side of the scale and made of stainless steel, are provided: Inner beam, 1 pound by ¼ ounce graduations, with self-locking, suspended poise; outer beam, 10 ounces by 1/10 ounce, with self-locking, suspended poise.

Stainless steel commodity platter, 9 x 9 inches.

Brass, chrome plated loose weights are provided to complete the capacity of the scale.

Foot scoops 10½ x 19 inches, made of nickel silver, with brass counterbalance weight.

Further information can be obtained from the manufacturer, The Exact Weight Scale Company, Columbus, Ohio.

• KEARNY MFG. CO., INC.

On August 1st, 1940, American Textile Engineering, Inc., Kearny, N. J., and its affiliated corporations, for many years makers of textile conditioning machinery and liquids, was merged into one new corporation, known as Kearny Manufacturing Co., Inc., with offices and shops at Kearny, N. J., and Greenville, S. C. All patent and trademark rights of said corporations will be transferred.

The opening of the Greenville office and shop is said to offer customers in the South the benefit of savings in freight as well as immediate delivery from Southern stock. John Klinck, representative for many years, will be in charge.

• RAYON CALENDER

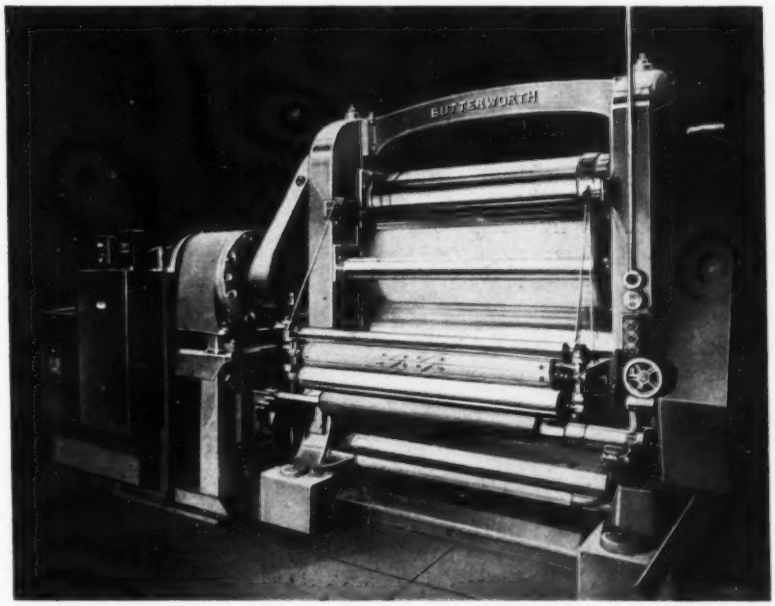
This new 80-ton 3-roll Hydraulic Calender for rayons is driven by a 30 H.P. two-speed geared motor mounted on a gear reduction unit capable of standing loads or reducing speed instantly. Drives from reducer to top roll by roller chain. Cloth speed is 80 to 40 yards per minute.

The top roll is chilled iron, 15" dia. x 56" face, and is steam heated. The middle roll is cotton, 22" dia. x 55" face. The bottom roll is chilled iron, 17" dia. x 56" face, and is steam heated.

Top and bottom roll bearings have an oil circulating and cooling system.

Some of the many outstanding features of the new 80-ton 3-roll Hydraulic Calender are a new style balanced let off, moulded fiber 3-bar adjustable tension device, rolls mounted in heavy duty roller bearings, special slip belt winder with clutch, streamlined hydraulic pump fully enclosed, new style accumulator with safety switches, special valves for control of hydraulic equipment.

Additional information can be obtained from the manufacturers, H. W. Butterworth & Sons Co., Philadelphia.



• CORROSION-RESISTANT ALLOY SHEET

Supplementing the original announcement of the availability of Hastelloy alloy C in rolled form, recent data indicate, according to the manufacturer, that the alloy possesses remarkably high strength and toughness for a material having such high resistance to chemical corrosion. The ultimate tensile strength of rolled and annealed Hastelloy alloy C sheet is in the range of 115,000 to 128,000 lbs. per sq. in., while its elongation in 2 in. is between 25 and 50 per cent. Brinell hardness is between 160 and 210. Hastelloy alloy C sheets and plates are also now available in all commercial thicknesses and sizes up to 200 lbs.

Hastelloy alloy C sheet, composed of nickel, molybdenum, chromium and iron, has outstanding resistance to wet chlorine. Rolled forms are already being used in chlorinating equipment and other chemical plant equipment for handling strong oxidizing agents. At the same time, the alloy is resistant, within reasonable limits of temperature and concentration, to hydrochloric acid, metal halide solutions, and sulphuric and phosphoric acids.

Some of the mechanical properties of the alloy in the cast form are a tensile strength of 72,000 to 80,000 lbs. per sq. in., an elongation in 2 in. of 10 to 15 per cent, and a reduction of area of 11 to 16 per cent. Its normal heat-treated hardness is 175 to 215 on the Brinell scale. A special hard analysis of this alloy, with a hardness of 322 to 372 on the Brinell scale, is now also available in cast form. Material of this analysis possesses the same high corrosin-resistance as material of the regular analysis, together with higher resistance to abrasive wear.

The alloy sheets, plates, and castings are manufactured by Haynes Stellite Company, a Unit of Union Carbide and Carbon Corporation, Kokomo, Ind.

• OPEN FORUM •

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Question

52—We are dyeing and finishing gabardines containing 15 per cent wool and 85 per cent rayon in the warp, while the filling is 100 per cent cotton and have considerable trouble with streaky shades warp wise on the face when dyed in tan shades.

It is possible that some of the readers of the OPEN FORUM may have suggestions regarding this difficulty.—**T. M. A.**

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